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CYCLOPEDIA OF AMERICAN AGRICULTURE

A POPULAR SURVEY OF
AGRICULTURAL CONDITIONS, PRACTICES AND
IDEALS IN THE UNITED STATES
AND CANADA

EDITED BY

L. H. BAILEY

With one hundred full-page plates and more than two thousand
illustrations in the text

IN FOUR VOLUMES
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CYCLOPEDIA OF AMERICAN AGRICULTURE

The course of this Cyclopedia has taken us through a study of the many questions that one must consider in the choice, layout and organization of a farm; thence to a review of the crop products of the farm; and then to a discussion of the animal products. We now come to the larger questions of the relation of the farmer to his fellow-man and of the farm to the other assets of the commonwealth.

There is no necessary completeness to such questions as we consider in this fourth volume. There is at least an imaginary limit to Volume II, for we set out to discuss all the kinds of crops and we must omit none. There is a similar boundary for Volume III. We can conceive a limit to such farm questions as are considered in Volume I. But in Volume IV there is no necessary order nor any imaginary limit to the sets of questions that it would be proper to discuss.

Therefore, the present volume is only fragmentary. A full outline of the subjects was prepared. When persons could be secured to handle the subjects, the parts were included; if good authorities were not readily found, the subjects were omitted rather than to be written up or compiled from other sources. That is to say, such material as the Editor has been able to collect, he has put together, without any special attempt to round out or to complete the field. The book comes far short of what the Editor had hoped for it; and yet he regards it as the most valuable volume of the four.

What has impressed the editorial office most in the preparation of this volume, is the great neglect in which all this attractive field has lain, and yet the wide-spread and sympathetic interest that there is in it among well-trained and public men. It is certain that in these fields there will be much activity in the years immediately before us; and the Editor would cherish the opportunity, were it possible to be his, some day to come back to the work and make a new review. Perhaps this volume will suggest what there is to be done, and stimulate at least a few persons to investigate. The great problems of the open country are human rather than merely agricultural: they are economic, social and educational; and they cannot be understood without an historical background.

The reader will be impressed, on the other hand, by the large numbers of persons who have spoken in this volume, and with the care and excellence of the subject-matter. These authors approach the subjects from many points of view; and a large part of them are not connected with agricultural institutions. The fact that others than farmers and teachers of farmers are interested in these subjects, is indication that the subjects are considered to be of concern to all men.

The Editor hopes that the studies presented in this volume will impress the reader that there is more to farming than the mere raising and selling of produce. We are really dealing with a great series of life occupations, on which the welfare of the whole people rests; and every human relationship and aspiration finds expression in them and through them. Such studies as these, much continued and enlarged, must form the basis of constructive politics. The governmental policies that deal with rural questions are likely to be haphazard or not founded on thorough knowledge of the conditions, and lacking in appreciation of the historical development of the rural industries.

For the first time in the history of the American people, measures have recently been taken in the United States to arrive at a business-like understanding of our national resources and of the larger rural conditions. This has come about through the appointment by President Roosevelt of two commissions to study these questions. One of these commissions will determine what we have in the bank; the other will determine how effectively the men and women on the land are able to improve and enjoy their opportunities. These and similar movements are good expressions of the new social politics, whereby selfish competition is to be controlled and wholesome coöperation encouraged, each man feeling his sense of responsibility to all other men. This species of politics is coming not so much as an expression of abstract theory, as in the application of foresight and honesty to the problems immediately before us.

It is most interesting to see how government gradually adapts itself to the economic requirements of the people. We have passed through an epoch of great development of concentrated and syndicated interests. Government has encouraged this solidification. The consolidated interests became oppressive, however, and the unattached man and unsyndicated business have suffered. The present governmental movement, on the economic side, is toward the protection and encouragement of the separate and the independent man. The agitation against trusts and monopolies, and the prosecution of corporate dishonesty, are expressions of this movement. Fundamental reconstructive suggestions have now been set in motion, as indicated in the preceding paragraph, and the next epoch will see emphasis placed on individualism and personal rights.

One of the hopeful results to be expected from the attention now being given to country-life subjects, is the placing of much of the responsibility for better conditions on the localities and the states. The responsibility of developing its schools and many other institutions rests naturally on the state itself; yet the state government may break down at this important point. The federal government may undoubtedly aid localities by statutes and appropriations, of general application; but this should never relieve the people of the respective states of the privilege of making tax-contributions in support of public institutions. The natural result of the encouragement of individual effort is that each individual shall be ready to contribute his full quota to the public welfare.

The effectiveness of all governmental policies and of all forms of rural improvement is conditioned on the intelligence of the people. The motive for education is primary to any progress. If it is necessary in any region to arouse public sentiment to the need of schools, the propaganda is in the nature of the case an educational method; it is an extension effort. There are two kinds of extension purpose,—to give instruction to those who desire it, to awaken a desire for instruction in those to whom such a desire is unknown. This latter or primitive kind of extension work is still much needed in parts of North America. It is incumbent on government—either local or central—to set this kind of extension work in motion. Some of it should emanate from the colleges of agriculture, because the best of these colleges are developing an educational method that will meet the needs. Some of these colleges are perfecting the ways of making the daily life a means of education, and these ways are now infecting all educational effort. An important part of the work of the leading ones of these institutions is necessarily extensional in one way or another, and this part of their obligation to the general public is now beginning to be recognized. The Editor has tried, in Chapter VIII, to explain the relation of the colleges of agriculture to the development of a new rural social structure in North America. The treatment of this subject does not lose sight, of course, of the value of all other educational agencies; but it is not the province of this Cyclopedia to discuss the public school system and other educational institutions.

The Editor has now conducted two Cyclopedias through the press. He would like to make another. It is much satisfaction to assemble the opinions of the best men and women, in a particular field, and to work them out into a harmonious arrangement. No small part of the satisfaction is the contact with several hundred writers. All of the contributors to this Cyclopedia have responded with singular freedom and good will and with the desire of aiding to set forth the ideals of a good country life. The Editor looks forward to the development of a substantial rural society of a new order, founded on scientific knowledge, personal mastery, local leadership, and high ideals of community service; all good writing on rural subjects will help to bring this about in some future time: he feels that the writers in these Cyclopedias have made their contributions in this spirit. The liberal policy of the publishers should not be overlooked, for the work would not have been possible without it.

In future editions, if such are called for, it may be necessary to change some of the articles, or even to substitute new ones, in order to make them contemporaneous. The Editor will be glad of suggestions, and also to be advised of errors and omissions. The greatest care has been taken to make every part of the work correct and authoritative, but the Editor cannot hold himself responsible if any errors or wrong advice may have crept in: the reader must use his own judgment, and assume the risks that are a part of all advice.

CHAPTER I

THE AGRICULTURAL WEALTH OF NORTH AMERICA

AGRICULTURE COMPRISES SO MANY OCCUPATIONS that one has great difficulty in arriving at a measure of the wealth that it produces. After the census has collected its figures, there are undoubtedly many items overlooked on the regular farms; and the census makes no effort to collect the figures of production of vegetables, fruits, flowers and poultry on numberless city and village properties. Every person can cause the land to produce something, and this effort is agriculture, however small it may be and whether it is made in a city back yard, in a roof-garden, window-garden or school-garden. The public parks of cities and towns, and the private parks of the great estates, often maintain extensive nurseries and breeding establishments; and the agricultural colleges and experiment stations, and the properties of many public institutions, are all producing things from the land. There is no other single occupational or productive effort in which so many persons engage as in land-culture of one kind or another. It is impossible to gather the statistics of all this effort. The appeal that all these pursuits make to these millions of persons is worth while discussing in its general social relations; and this discussion constitutes the theme of the present volume.

The measure of our agricultural productiveness is taken in terms of census figures, in records of exports, and in general estimates of yields. It would be interesting to compute the total activity, in details, of any acre of land. This would give us a new picture of the productiveness. None of us realizes the extent of the stuff that grows out of the earth every year. A bushel of wheat contains an average of 720,000 kernels. If the yield of an acre is thirty bushels, the total number of grains is well toward 22,000,000. The number of culms or stalks per acre is some 330,000; if each stalk is three feet tall, the total is nearly two hundred miles. There are also miles of roots and miles of leaves. There is only one grain to one flower, and many flowers may not set fruit: all these millions of flowers bear their stigmas and anthers and produce their numberless pollen-grains; and every plant has its countless numbers of cells, every one with its complex contents and contributing its part to the vital processes.

A ton of average well-dried timothy hay, with the smaller grasses going with it, may contain upwards of 1,500,000 separate stalks, and an acre may yield four tons. An average-length head of timothy will bear from 400 to 500 flowers.

An acre of apples in full bearing may yield 100,000 good fruits. Each fruit normally has ten seeds. Probably at least ten flowers fail for every one that produces a good apple. Countless weeds or other plants may be growing at the same time on the same acre.

An average large tomato may contain 1,200 seeds, and a good yield of tomatoes will produce at least 120,000 fruits to the acre. This means 144,000,000 seeds, each one of which is the result of separate fertilization; and any number of pollen-grains are likely to fail to one that succeeds in impregnating an egg-cell.

These figures give some idea of the capabilities of an acre of land. This performance, under one crop or another, may be continued year after year, if the treatment is good. There is no necessity that land should grow poorer.

The potentialities of an acre of land are also to be considered. Perhaps no person yet feels that he has produced from any area all that it is ultimately capable of yielding. The florist, of all agriculturists, comes nearest to realize the full possibilities of land. His pot of soil is mixed and sifted; the results show in the enormous production that he gets out of it: consider how large a plant may grow in a four-inch pot. It may not be good economy at present to make every acre produce its utmost; but it is well to realize what our potential wealth is. It is on this potential wealth that the welfare of society rests.

THE EXTENT OF AGRICULTURE IN NORTH AMERICA, AND A COMPARISON WITH OTHER INDUSTRIES.

By *L. G. Powers*

Agriculture may well be defined as the science and art of the production of all plants and animals useful to man. This being the case, agriculture as an industry includes all lands employed in growing plants and raising animals; all the plants and animals in existence on such land; the crops, animals and animal products raised or produced; and all the labor employed in the cultivation of the fields, the nurture of animals, the care of the forests, and the marketing of the animals and crops produced. As subdivisions of agriculture, must be classed all special industries to which are given the specific names of general farming, horticulture, forestry, live-stock breeding, poultry-raising, bee-keeping, and the like. Of agriculture as above defined, it is impossible at present to secure any trustworthy statistics. Such statistics are available for only that part of the aggregate industry included in the census report of farms and their live-stock and products. It is for this reason that in this article—except as otherwise specifically stated—agriculture is limited to that part of the actual industry last mentioned, that is, to farms, their live-stock and products.

The fact that statistics are available for only a part of agriculture calls attention in a forcible manner to the difficulty of making just and perfect comparisons between agriculture and other industries. For agriculture, it is impossible to secure information relating to the area and value of the land on which are growing forest trees, or the value of forest products apart from the farms. It is also impossible to secure any data concerning the value of the public domain used for grazing purposes. A similar lack of data may be noted in connection with nearly every other branch or subdivision of the industry. No such lack of data is met with in connection with manufactures, or transportation by rail or water. As a result, unless some allowance is made for this lack, all comparison of agriculture with the other industries here mentioned will fail to give the proper weight to the one on which all others must rest as a basis.

Statutes authorizing the census of manufactures have, since 1850, required that the schedules prepared shall contain an inquiry as to the "amount of capital invested." In arranging its schedules and instructions, the Bureau of the Census has directed its agents to include as the capital of manufacturing establishments all amounts owned or borrowed by them, and represented by lands, buildings, machinery, tools, and implements owned, cash on hand, bills receivable, unsettled ledger accounts, raw material, stock in process of manufacture, finished products on hand, and other sundries of various kinds. The three items first mentioned are generally spoken of by business men and accountants as fixed, and the other items as circulating or live capital.

Capital invested in agriculture and manufactures.

The capital invested in agriculture, as reported by the census, includes farm land, buildings, machinery, implements and live-stock on farms and ranges. It does not include the value of the land used for grazing purposes on the western cattle ranges, nor that of lands other than those of farms covered with growing timber. Further, it does not take account of more than a part of the capital used in the operation of farms. The circulating capital included in the census report is made up of implements, machinery and live-stock; the part omitted consists of the farm products on hand at the date of enumeration, the money due from the sale of other products, the value of growing crops in the year of enumeration, and the cash on hand and in the bank for conducting farm operations until the succeeding crops are marketed. With so much fixed and circulating capital omitted from the census statistics of agriculture but included in those of manufactures, no comparison can be made between the census reports of the capital of agriculture and of manufactures that does not exaggerate the latter at the expense of the former.

No data are at hand for estimating the value of lands, other than those of farms, used for growing timber, or for estimating the value of government land in the western states employed for grazing purposes. It is possible, however, to estimate with only a small margin for error the amount of omitted "circulating capital" required for the management of farms and the conduct of farming operations. Such capital at any given time cannot be less than 50 and it may exceed 60 per cent of the value of the crops and other farm products of the preceding year. On that basis, estimates have been prepared of the circulating capital of farmers, and the same are included in the comparative exhibits of agricultural and manufacturing capital that are given in a succeeding paragraph.

A census of manufacturing establishments was taken in 1905 as well as in 1900. No census of agriculture has been taken since 1900; therefore, no comparison based on census enumeration can be made between farm and manufacturing capital later than 1900. To show approximately the relative changes in the two classes of capital, the writer has prepared estimates of the farm wealth in 1905. These are based on the census reports of real estate values in 1900 and 1904, and the reports of the Department of Agriculture relating to farm values, the number of domestic animals on farms, and the farm products in 1904.

Prior to 1905, the census of manufactures had always included statistics of the hand or mechanical and neighborhood industries. These were omitted in 1905. To make just comparison between the aggregate capital reported by the census prior to 1905 and that reported in 1905, the Bureau of the Census has for the latter year estimated the amount of capital in the industries omitted at that time. Using that estimate, and preparing agricultural estimates as above set forth, we have the following comparative exhibit of the capital invested in agriculture and manufactures in 1905, 1900 and 1890. For manufactures, two columns are presented, one giving the capital of the factories proper; and the other, that of factories combined with mechanical and neighborhood industries previously included in the census reports of manufactures. The figures for this table, as for all other tables in this article, are for continental United States, as the census designates the whole of the nation exclusive of Alaska, Porto Rico and Hawaii.

CAPITAL INVESTED IN AGRICULTURE * AND MANUFACTURES IN CONTINENTAL UNITED STATES, 1890 TO 1905.

Forms of wealth	*Agriculture	† Manufactures	
		Factories	Factories, mechanical and neighborhood industries.
1905—			
Total	‡$27,500,000,000	$12,675,580,874	§$13,861,350,572
1900—			
Total	22,939,901,164	8,975,256,496	9,813,834,390
Land	13,058,007,995	Not separately reported	1,027,368,280
Buildings	3,556,639,496		1,449,403,782
Implements, tools and machinery	749,775,970		2,541,046,639
Live-stock	3,075,477,703		. . . .
Cash and sundry live capital	‡2,500,000,000		4,796,015,689
1890—			
Total	18,082,267,689		6,525,156,486
Land	‖ 13,279,252,649	. . . .	775,586,849
Buildings		. . . .	878,570,737
Implements, tools and machinery	494,247,467	. . . .	1,584,276,390
Live-stock	2,308,767,573	. . . .	. . . . .
Cash and sundry live capital	‡2,000,000,000	. . . .	3,286,722,510

* Exclusive of the value of timber lands not on farms, and of government lands used for grazing purposes.
† Including the capital employed by steam and street railroads, in shops for constructing and repairing locomotives and cars.
‡ Estimated. § In part estimated. ‖ Not separately reported.

In fifteen years the agricultural capital invested in farms and in their operation increased approximately 50 per cent, while the corresponding increase in all manufacturing capital was a little more than 100 per cent. But agricultural capital still leads that of manufactures by a great margin, although the relative amount of that margin is decreasing with the passage of time. In 1890, the capital invested in farms and farming operations was 2.77 times; in 1900, 2.34 times; and in 1905, 1.98 times that invested in all manufactures. Further, the agricultural capital was, in 1900, 2.56 times that invested in what the census now calls factories, and in 1905 it was 2.18 times the factory capital. If the value of all agricultural resources of continental United States were ascertained and included in a comparative statement such as has been given in the preceding table, it is very probable that in spite of the recent enormous relative increase of manufactures, the wealth utilized at the present time for agricultural purposes would be shown to be over twice the corresponding investments in manufactures.

Persons engaged in agriculture and manufactures.

The Eleventh and Twelfth Censuses have given us the total number of persons engaged in gainful occupations, the total number of such persons depending chiefly on agriculture for their support, as well as the total number of proprietors, firm members, and salaried employees, and the average number of wage-earners, employed in all manufactures in 1890 and 1900. The manufacturing census of 1905 gives the same statistics for that year for all manufacturing establishments other than those that are denominated mechanical and neighborhood. The number of salary- and wage-earners in the branches of manufactures last mentioned has been estimated by the Bureau of the Census, and on the same basis the number of proprietors and firm members of those branches has been estimated by the writer. The writer has also prepared estimates of the number of persons engaged in gainful occupations who depended chiefly on agriculture for support in 1905. These numbers are presented in the table given on page 6.

In 1890, the persons reported as employed in agriculture constituted 37.7 per cent of all those engaged in gainful occupations, while in 1900, the corresponding percentage was 35.7.

A critical analysis of the census occupation tables for 1890 and 1900 leads to the conclusion that in 1890 fewer children under sixteen were reported than should have been included, and than were included in 1900. The Twelfth Census corrected its occupation tables for 1890 to allow for these omissions, and the corrected figures are given in the following table. They indicate that the relative decrease in the number of agricultural workers was that indicated by the percentages 39.2 and 35.7, for 1890 and 1900. During the ten years the number reported as employed in agriculture increased 13.5 per cent, but the accompanying increase in other occupations was so much greater that the relative importance of agriculture, measured by the number engaged therein, decreased as shown by the percentages given.

PERSONS ENGAGED OR EMPLOYED IN AGRICULTURE AND MANUFACTURES IN CONTINENTAL UNITED STATES, 1890 TO 1905.

Industry and classes of employees	Number of persons engaged or employed		
	1905	1900	1890
All industries*	. . . .	29,073,233	†23,318,183
Agriculture‡	§11,050,000	10,381,765	†9,148,448
Factories**	6,213,622	5,293,462	††
Proprietors and firm members	225,673	§216,579	††
Salaried employees	519,566	364,120	††
Wage-earners	5,468,383	4,712,763	††
Factories, mechanical and neighborhood industries§	7,341,482	6,275,389	‡‡4,712,622
Proprietors and firm members§§	625,000	572,569	‡‡
Salaried employees	565,980	396,677	‡‡
Wage-earners	6,150,502	5,306,143	‡‡

*Includes all persons engaged at gainful occupations.

†Numbers as corrected by the Twelfth Census.

‡Includes all persons engaged at gainful occupations and depending chiefly upon agriculture for support.

§Estimated.

**Including the employees of steam and street railroads in shops for constructing and repairing locomotives and cars.

††Not separately reported in 1890.

‡‡Classification of those engaged different from that used in later years, and figures for classes of labor not separable.

§§In part estimated.

In 1890, those employed in all manufacturing enterprises averaged for the year 20.2 per cent of those engaged in all gainful occupations, while in 1900 that percentage was 21.6. The average number employed in manufactures increased in ten years 33.2 per cent. This percentage of increase was materially greater than the corresponding increase of agriculture. In 1890, there were, according to the foregoing table, 1.94 agricultural workers for every one engaged in factories and mechanical and neighborhood industries, and the corresponding ratio for the two classes of workers in 1900 was 1.65. From 1900 to 1905 the average number employed in factories and mechanical and neighborhood industries increased 17 per cent, which is double the estimated increase of national population, and of course greater than the percentage of increase in the number of all persons employed in gainful occupations. A part of this gain was no doubt at the expense of agriculture. The corresponding gain for agriculture cannot have been over 8, and possibly did not exceed 5 per cent. If the mean of the two percentages is assumed to be correct, the number of persons employed in agriculture in 1905 was approximately 11,050,000. This would give 1.78 agricultural workers for every 1 employed in factories, and 1.50 for every 1 employed in factories and mechanical and neighborhood industries. It is a question, however, whether the census of 1910 will not report ratios more nearly approaching those of 1900 than those here estimated for 1905. The enormous increase in city population from 1900 to 1905, due in large part to an unprecedented immigration, has increased the number of factory workers faster than that of agricultural toilers and that of most other gainful occupations. These social phenomena will hardly be repeated in the years 1905 to 1910, hence the possibility stated above.

The figures given in the table for persons engaged in agriculture and manufactures are not wholly comparable, since those for agriculture are for persons obtaining their support chiefly from that industry, while those for manufactures include in the column for wage-earners only the average number of such employees at work throughout the year. For the purpose of ascertaining the relative amount of mechanical energy exerted by workers in agriculture and manufactures the number of agricultural workers given in the table may with good reason be reduced by 10 per cent,– the amount by which the total number obtaining support chiefly from manufacturing and mechanical pursuits exceeded the number engaged in manufactures as given in the preceding table. With such reduction, but without making deductions for the persons employed by steam and street railroads in shops for constructing and repairing locomotives and cars, the ratios between the number of agricultural toilers and the number of factory workers would be as follows: In 1900, 1.76, and in 1905, 1.60. The corresponding ratios between agricultural workers and those employed in factories and mechanical and neighborhood industries were: In 1890, 1.75, in 1900, 1.49, and in 1905, 1.35. These ratios should be compared with the corresponding ratios of capital invested in the two industries. For the same years the latter were 2.77, 2.34, and 1.98, respectively. The number of workers in manufactures has increased in the fifteen years much faster than that of those engaged on farms, and the number will probably exceed that of the farm toilers sooner than manufacturing capital will be greater in amount than that of agriculture.

Power employed in agriculture and manufactures.

An essential part of the census report of manufactures is its exhibit of the power employed. That power adds enormously to the effectiveness of the factory worker. In its increase is found the most important factor of the growing primacy of American manufactures in the world's markets. The energy of steam engines, water-wheels, and other motors employed in factories is expressed in terms of "horse-power," or the work that the average horse can perform. This is computed as equal to that of six men, on the average. The census gives the "horse-power" thus employed in manufactures. No corresponding statement of the horse-power of engines employed in threshing grain, plowing, pumping water, or performing other agricultural work is attainable. Such power is, however, very considerable. The census has reported the number of horses, mules, and asses on farms. These numbers include those of growing animals, as well as those of mature years, employed in farm work. A complete separation of growing and working animals is made for 1900, and on the basis of such separation an approximate statement may be prepared of the working animals employed on the farm in 1890; and, taking advantage of the estimates of the Department of Agriculture for 1905 and 1906, a similar statement may be given for 1905. Such statements follow, the figures for farms being for June 1, and those for factories, for January 1, of the year mentioned:

Animal and Mechanical Power Employed in Agriculture and Manufactures in Continental United States, 1890 to 1905.

Year	Working horses and mules on farms and ranges	Horse-power of engines, water-wheels, and other motors in	
		* Factories	* Factories and mechanical and neighborhood industries
1905	† 20,000,000	14,461,989	14,638,593
1900	18,259,452	10,408,267	10,408,267
1890	† 15,000,000	‡	5,954,655

* Including that employed by steam and street railroads in shops for constructing and repairing locomotives and cars.

† Estimated on basis stated above.

‡ Not separately reported.

The foregoing table does not include the power of steam engines used for threshing, pumping, grinding, and other purposes; or the power of windmills utilized for pumping and grinding. That power is very considerable in the aggregate and, if known, would appear as a very important factor in the effectiveness of farm labor. The number of working horses and mules on farms—that is, of horses and mules over two years old—is, however, greater than the reported horse-power of steam engines, water-wheels, and other motors in all factories and mechanical and neighborhood industries. It is possible that the effective mechanical energy exerted by a "horse-power" in a factory is somewhat greater than that put forth by the average horse or mule on the farm. Owing, however, to a lack of detailed information concerning the idle time of these animals and of factory motors, no comparison can be made that may not be questioned. It is probable, however, that the idle power is the same relatively in the two industries. On this assumption it is very probable that the numbers given in the preceding table present a fairly correct picture of the relative amount of animal and mechanical power that is combined with that of man and directed by human intelligence on the farm and in the factory.

Allowing that the work actually obtained in practice from farm horse and mule and from factory motor is five-sixths of its theoretical amount, or that in each case the "horse-power" is the equivalent of the labor of five human beings, the energy exerted by the men and women aided by this animal and mechanical power, for the years 1890, 1900 and 1905, was substantially as set forth in the table that follows. In making the calculations for this table, the number of farm workers given in a preceding table has been reduced by 10 per cent, for the reasons stated in a previous paragraph:

Mechanical Work in Agriculture and Manufactures in Continental United States, 1890 to 1905.

Year	Units of human labor exerted by employees on the farm when assisted by horses and mules, and by employees in manufacturing establishments when assisted by mechanical motors.		
	On farms	In factories	In factories and mechanical and neighborhood industries
1905	109,945,000	78,523,567	80,534,447
1900	100,640,849	57,334,797	58,316,724
1890	83,233,602	*	34,485,897

*Not separately reported.

In 1890 there were, as was pointed out in a preceding paragraph, 1.75 effective farm workers to every 1 in factories and mechanical and neighborhood industries; while in 1900 and 1905 the corresponding ratios were 1.49 and 1.35, respectively. Here is a marked change in fifteen years. There was, however, a greater one in the amount of human, animal, and mechanical energy exerted. The ratio of that energy on the farm to that exerted in the factories and mechanical and neighborhood industries, as indicated by the preceding table, was 2.41 in 1890, 1.73 in 1900, and 1.36 in 1905. The farm, however, still leads the factory, in spite of the tremendous application of artificial power in the latter; the mechanical energy exerted upon the farms of the nation was in 1905 approximately 1.36 times that utilized by all manufacturing establishments.

Wealth created in agriculture and manufactures.

The margin of probable error in the comparisons already presented between the capital of farms and that of manufactures, the number of persons engaged in work in agriculture and in manufactures, and the energy of animals and mechanical motors utilized in the two industries, is small. It is otherwise with all other comparisons that may be prepared for the two industries. All statistical data, except those included in the foregoing comparisons, are collected on such different bases, or the industries are so different in character, that comparisons are possible only by methods that are indirect and that involve a large margin for the exercise of individual judgment, and thus of possible error. Of these differences, attention is first called to the following: Manufactures utilize large amounts of the products of other industries, or of its own, while agriculture uses them only to a very limited extent. The only products of other industries that it purchases are artificial fertilizers, and trifling amounts of machine-oil and kindred materials. Of its own products, it utilizes the crops fed to live-stock.

This fundamental difference between the methods of agriculture and of manufactures makes it impossible to secure any significant comparison between the aggregate values of the products of the two industries. Further difficulties are met with in securing just comparisons between the values of the products of labor on the farm and in manufacturing establishments, by reason of the following facts: On farms and in manufacturing establishments much labor is expended in adding to the value of the permanent properties included in the invested capital. On the farm this labor is utilized in constructing buildings, fences, and drains, and in making other improvements that add to the value of the real property; but the value of such labor is not reflected in the census reports of farm products. In the companion industry, an important part of the products of manufactures consists of the machinery produced by one establishment for another, and the factory products utilized in the construction of new factory buildings. All such contributions to the permanent wealth of the nation are included in the census report of the value of manufacturing products.

The error that would result from disregarding this difference in the census statistics of farm and factory products may be noted by observing the following facts: From 1890 to 1900 the value of farm land, including improvements, increased in continental United States from $13,279,252,649 to $16,614,647,491, a gain of $3,335,394,842. Of this vast aggregate, at least $2,000,000,000—and probably much more—was called into existence by farm labor. It is as much the product of such labor as machines made in one factory for use in another are products of factory labor. The average annual wealth creations of this class on American farms are unquestionably not less than $200,000,000, and may equal $250,000,000.

More or less labor and money are expended every year on farms and in factories for "repairs," and money thus expended is a part of the "miscellaneous expenses" of the factories, but so far as the same was paid to other manufacturing establishments, it is included by the census in its report of the value of factory products. No corresponding amounts are included in the census reports of the value of farm products. Neither the repairs on farms nor those in factories add to the material wealth in existence, but the census statistics of manufactures are so presented that the cost of repairs cannot be separated from the value of products, nor from the derivable statements of the additions to material wealth by processes of manufactures. Under the circumstances, no just comparison of the additions to national wealth by the farm and the factory can be made without some allowance for the cost of repairs and renewals on farms and in factories. That cost is greater relatively in factories than on farms, and amounts to a considerable sum every year, and cannot be less than 5 and may exceed 10 per cent of the value of the buildings, machinery and tools reported by manufactures.

On the farm and in the factory, moneys paid for rent, interest, stock dividends, and taxes are payments out of the wealth created by the industries, and are in fact the distribution of such wealth between the owners, creditors, and the government. All payments to other industries, or by one factory to another for services rendered, must be considered as expenses to be deducted from the aggregate value of products to ascertain the net additions to national wealth by either of the industries. Under these circumstances, allowance must be made for the unknown amounts paid by manufacturing establishments for advertising, and for traveling expenses of agents. In comparisons, these expenses are to be deducted from the census exhibits of the wealth creations or additions of manufactures, but not from those of agriculture. There is but little information at hand on which to base an estimate of the error arising from a neglect of this factor in comparisons of data relating to the wealth creations of the industries under review.

The Tenth and Twelfth Censuses have called attention, in the volumes relating to agriculture, to the impossibility of securing a complete report of the products of the farm. Much of the food of farm families is obtained from the farm, in the form of meat, milk, butter, cheese, poultry, eggs, vegetables, and fruit. No agricultural census has ever been able to obtain any adequate return of the products thus used for food, while the census of manufactures does secure a report of all factory products consumed by those engaged in manufactures. The difference arises not from any defect of the census methods, but from the methods of bookkeeping in the two industries, and the way the farmers look upon such consumption. Again, as has been pointed out by the censuses from 1880 to 1900, the census of agriculture, while attaining great accuracy and completeness for the major crops and animals, is very incomplete for the minor crops and dairy, poultry, and other animal products. The combined result of the two factors mentioned in this paragraph is estimated by those in charge of the census of agriculture to be not less than 10 per cent of the value of the farm products not fed to live-stock.

With the foregoing review of the defects in the census statistics relating to the comparative additions made by agriculture and manufactures to the national wealth, there is presented in the following table an exhibit of the available census data relating to the subject. Without allowing for the factors mentioned, the table is necessarily misleading. With such allowance, it will assist the student to an approximate comprehension of the relative contributions of the two industries to the national wealth, as the value of such contributions is determined in the markets of the world:

WEALTH CREATED IN AGRICULTURE AND MANUFACTURES IN CONTINENTAL UNITED STATES, 1890 TO 1905.

Year	Value of agricultural products not fed to live-stock. less cost of artificial fertilizers	* Value of manufacturing products less cost of materials	
		In factories	In factories and mechanical and neighborhood industries
1905	†$4,500,000,000	$6,293,694,757	‡$7,364,551,186
1900	3,688,698,447	4,831,075,210	5,656,521,284
1890	†2,900,000,000	§	4,210,393,207

*Including the products of steam and street railroad shops engaged in constructing and repairing locomotives and cars.

†Estimated.

‡In part estimated. See accompanying text.

§Not separately reported.

The Bureau of the Census ascertained for 1900 and 1890 the value of the products of factories and mechanical and neighborhood industries, and also the cost of the materials used by them. For 1905 that Bureau ascertained similar facts for factories, and prepared estimates for the mechanical and neighborhood industries. For 1900 and 1905 it stated separately the same class of information for the factories of the United States including Alaska. The values of products and of materials used are reported separately for Alaska for 1905; for 1900 no such separate report is given for Alaska. On the basis of those data reported for Alaska and for the other states and territories, the writer has estimated the excess value of factory products over cost of materials for continental United States.

In 1900, the census secured the first approximate report of the total value of all agricultural products, the value of the part fed to live-stock, and the amount expended for artificial fertilizers. The margin of possible error in these figures has already been set forth in detail. On the basis of the crop reports of the Department of Agriculture for 1904, the census report for quantity of crops for 1889 and 1899, and the statement of the average value of those crops, as prepared by the Department of Agriculture, the writer has estimated the value of the farm products not fed to live-stock, less the cost of fertilizers purchased in 1889 and 1904. These estimates are prepared on a basis to correspond with the census figures for 1899 given as of the census of 1900. They involve the same comparative error as has been pointed out in connection with the census report for 1900.

The value of the products of factories less the amount expended for materials in 1900 was 1.31 times the reported value of agricultural products not fed to live-stock, after deducting the cost of artificial fertilizers purchased. The corresponding ratio in 1905 was 1.40. When the same general comparisons are made between the farm and all factories and mechanical and neighborhood industries, the ratios were, for 1890, 1.45; for 1900, 1.53, and for 1905, 1.64. These ratios, for the reasons previously explained at length, are not accurate—nor even approximately accurate—exhibits of the relative additions to the wealth of the United States made by the two industries in the years mentioned. The facts passed in review indicate that the figures taken as indices of those additions exaggerate the contributions of the factories and mechanical and neighborhood industries, at the expense of the farm, from 15 to 25 per cent. The nature of the data does not permit of a closer statement of the weight to be given to the unascertained errors in the two classes of statistics that are here employed for measuring the relative wealth contributions of the two industries.

If the error due to the omitted farm products and the non-comparable data included in the statistics of manufactures, but omitted from the statistics of farm products is that represented by the smaller percentage, viz., 15, then the contributions of the factories to the wealth of the nation were, in 1900, 1.14, and in 1905, 1.21 times that of the farm. On the other hand, if the error is that represented by the larger percentage, viz., 25, the ratios were 1.05 and 1.12, respectively. The corresponding ratios between the farm and the factory combined with the mechanical and neighborhood industries were, if the smaller ratio is the correct one, 1.26 for 1890, 1.33 for 1900, and 1.43 for 1905; while, if the true measure of the error is the larger percentage mentioned, those ratios were 1.16, 1.23, and 1.31, respectively, for the years mentioned.

These percentages indicate that prior to 1890 the combined manufacturing enterprises reached the position where they began to contribute to the wealth of the nation more than did the farms; while in 1905, the corresponding contribution exceeded that of the farms by from 31 to 43 per cent. Using either percentage, the average effectiveness of factory labor measured by the standards of the markets of the world has, for the whole period covered by the tables, been greater than that of the farm, in spite of the larger use of animal and mechanical motors on the farm than of mechanical motors in the factory. Some of the factors contributing to this greater effectiveness of factory labor will be considered in the discussion which follows concerning the compensation of labor in agriculture and manufactures. In this connection it suffices to note that, combining the ratios previously given of the number of those engaged in agriculture and in factories and mechanical and neighborhood industries, and those last given showing the greater additions to the national wealth by the latter industries, it is found that the apparent effectiveness of labor in manufactures, measured by the standard of the market place, has, since 1890, been from 1.75 to 2 times that on the farm, according to the percentage allowed as correction for omitted farm products, or, in other words, for every dollar added to national wealth by a single farm worker, his fellow toiler in the factory added from one dollar and seventy-five cents to two dollars.

Remuneration of labor on farm and in factory.

In seeking to make comparisons between the average compensation of those engaged in agriculture and in manufactures, many difficulties present themselves. The greater number are similar to those already reviewed in discussing the additions to national wealth made by labor in the two industries. Mention is here made of some other factors that must be taken into consideration in all attempted comparisons.

The census of manufactures for 1890 gave the number of salary- and wage-earners, the number of proprietors and firm members, and the compensation they all received for their labor; in 1900 the census reported the number of these classes of workers in factories and in mechanical and neighborhood industries; and the census of 1905 secured the number of these classes in factories, but the census of 1905 as that of 1890 secured no report of the value of the services of the proprietors and firm members. The number of these classes of factory toilers constituted but a small portion of the total number of those engaged in manufactures, and for purposes of comparison with agriculture their average compensation as factory workers, for 1900 and 1905, may be assumed to be the mean of the two averages for salary- and wage-workers. This was $726 in the former year and $782 in the latter. Such assumed average earnings of the factories' proprietors and firm members may possibly be materially in error; if so, it is too large, and may cause an error of from 1 to 3 per cent in the calculated average compensation for all engaged at work in manufactures.

The Twelfth Census of agriculture secured a report of the amount paid on farms for hired labor. No similar information is available for any year other than 1899. For comparison with statistics of manufactures this information has no value, since the greater number of agricultural workers are farmers and the members of their families, none of whom receive wages. The value of the labor of farmers and others engaged in productive labor on the farm can, however, be estimated with only a small margin of probable error. In nearly all parts of the country, farms are leased on the basis of approximately one-half the marketed products[1] less cost of fertilizers purchased. The tenant's share is the compensation that he receives for his toil and that of his household and hired employees. Assuming that the compensation for the labor of owners operating their farms is the same, the earnings or compensation for the labor of the toilers on farms is here estimated as one-half the value of the farm products not fed to live-stock or expended for fertilizers, plus an estimate for the value of products consumed by the family as food. The value of the crops not fed to live-stock and the cost of fertilizers, subject to certain limitations already explained, was given by the census for the year 1899,—the crop year for the Twelfth Census, and it is identical with the period covered by the Twelfth Census of manufactures collected in 1900. Estimates have been presented in the last table for the corresponding value of farm products for 1890 and 1905.

A comparison between the value of one-half the farm products not fed to live-stock and the aggregate amount paid as salaries and wages in factories, and the estimated compensation for the labor of factory proprietors and firm members, would not, however, be just to the farm.

The census report of the value of farm products, that is here made the basis of comparison, is not a complete exhibit of such value. As has already been pointed out, that report does not include any account of the amount or value of farm labor utilized in making permanent improvements and repairs to the fixed properties of the farm. Further, it fails to account for more than a portion of the value of the minor crops and of crops and products consumed as food on the farm. If proper allowance is made for these factors and for the farm products reported by the census but consumed on the farm as food and allowed as compensation in the case of tenant and other farmers, it would be seen that one-half the reported value of farm products not fed to live-stock, less one-half the cost of fertilizers, is not a correct exhibit of the actual value of farm labor or of the compensation secured by the agricultural toilers for their labor, but falls short thereof by not less than 20, and possibly by more than 35 per cent of the reported value of the products not fed to live-stock. Keeping the foregoing facts in mind, a comparison between one-half the reported or estimated value of farm products not fed to live-stock, less amounts paid for artificial fertilizers, and the reported and estimated amounts received by or engaged in manufactures, and the wage-earners in the industry, will assist in giving an approximate idea of the relative compensation secured by the two classes of toilers for their labor.

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[1] The marketed products are those not fed to live-stock, less the amount of products consumed as food by the farm family.

COMPENSATION OF PERSONS ENGAGED IN AGRICULTURE AND IN MANUFACTURES IN CONTINENTAL UNITED STATES, 1890 TO 1905.

Year	One-half the value of farm products not fed to live-stock, less amounts paid for fertilizers	*Earnings of those employed in manufactures			
		Employees in factories		Employees in factories and mechanical and neighborhood industries	
		All employees	Wage-earners	All employees	Wage-earners
1905 . .	†$2,250,000,000	‡$3,361,361,461	$2,610,444,953	‡$4,101,339,623	$3,013,293,793
1900 . .	1,844,349,223	‡2,546,368,794	2,008,361,119	‡3,171,730,204	2,320,959,197
1890 . .	†1,450,000,000	§	§	2,283,216,529	**

*Including the earnings of employees in steam and street railroad shops engaged in constructing and repairing locomotives and cars.

†Estimated on basis explained in text.

‡Including estimates of compensation of proprietors and firm members, on basis explained in text.

§Not separately reported.

**Figures as reported not strictly comparable.

Average Annual Earnings or Compensation of Those Engaged in Agriculture and in Manufactures, in Continental United States, 1890 to 1905.

Year	Averages for those engaged in				
	* Agriculture	Factories		†Factories and mechanical and neighborhood industries	
		All employees	Wage-earners	All employees	Wage-earners
1905	$226	$541	$477	$559	$490
1900	197	481	426	505	437
1890	176	‡	‡	484	§

*For character of data from which computed, see text.

†Including the earnings of employees in steam and street railroad shops engaged in constructing and repairing locomotives and cars.

‡Not separately reported.

§Figures as reported not strictly comparable.

If the earnings or compensation of farm labor be only 20 per cent greater than the amount given in the first column of the table on page 10, then such earnings or compensation constituted, for 1905, 103.4 per cent of the compensation of the wage-earners in factories, and 89.6 per cent of that of the wage-earners in factories and mechanical and neighborhood industries, 80.3 per cent of the compensation of all factory workers, and 65.8 per cent of the earnings of the workers in all factories and mechanical and neighborhood industries. If, however, as is more probable, the actual earnings or compensation of farm labor be 35 per cent greater than is shown by the figures of the first column, those earnings constituted the following percentages of the same earnings of those engaged in manufactures in 1905: 116.4, 100.8, 90.4, and 74.2, respectively.

With a larger number of workers upon the farm than in manufactures, and with a greater assistance of animal and mechanical power on the farm than in the factory, the foregoing table shows that the total compensation for those engaged in manufactures is greater than for those on farms, and that the compensation of the wage-earners in all manufacturing industries is substantially the same as that of all employed on the farm. This difference in compensation explains the greater relative additions to national wealth by manufactures, as disclosed in the preceding table.

The greater yearly wage, or compensation, of those employed or engaged in manufactures is, however, not fully disclosed by the table (page 10), but is shown in the table above. In computing the figures included in that table it is assumed that the average number employed or engaged on the farm was each year only 90 per cent of the total number given in the preceding table as deriving their support chiefly from agricultural labor. The amount given in the columns for farm workers as the average annual earnings or compensation of the farm toiler is obtained by dividing the amount given in the preceding table as one-half the value of farm products not fed to live-stock, less amounts paid for artificial fertilizers, by the number of farm workers as above set forth. The averages thus secured are subject to the same limitations for census omissions as was the case in the totals already considered. These averages are therefore of necessity from 20 to 35 per cent less than the actual average earnings of those engaged upon the farm.

After allowing a correction of 35 per cent in the foregoing averages for the farm, it is found that the corresponding average earnings for persons engaged or employed in manufactures and mechanical and neighborhood industries were, in 1890, 2.04 times, in 1900, 1.89 times, and in 1905, 1.83 times as great; while the corresponding ratios for wage-earners in the same industries were 1.64 in 1900 and 1.61 in 1905. If the smaller correction of 20 per cent is taken, the foregoing ratios for all employees in all manufacturing establishments will be 2.29, 2.14, and 2.06, respectively; and for the wage-earners of such establishments, 1.84, and 1.81, respectively. A small part of the decrease in ratios from 1890 to 1905 arises, doubtless, from errors in the estimates for agricultural products for 1890 and 1905. The larger part, however, reflects the greater increase that has taken place in wages and profits on farms than in factories during the intervening years.

The foregoing ratios are slightly different from those which measure the relative efficiency of labor in the two industries. These were presented in connection with the analysis of the data relating to the respective additions to or creations of material wealth in agriculture and manufactures. Using the smaller percentage of correction for omitted farm products, the analysis referred to indicated for all the years, 1890 to 1905, an average effectiveness for labor in manufactures approximately 1.75 times that of the farm; while, using the larger percentage for correction, that effectiveness was 2. The compensation for labor in the factories is shown by the percentages of the preceding paragraph to be greater relatively than its effectiveness, and the change in that compensation in the past fifteen years marks a movement in America towards a payment for farm labor that is more nearly in accordance with its effectiveness than was in vogue in 1890.

Of the factors leading to greater average earnings or compensation of those engaged in manufactures, mention is here made of a few: With rare exceptions, farm workers, owners, tenants, members of their households, and hired employees are provided with house and home on the farm as a part of their compensation; while factory employees, as an average, expend—according to the report of the United States Bureau of Labor—over 18 per cent of their income for house rent. The part of the earnings that those employed in factories can expend for purposes other than house rent constitutes, therefore, only 82 per cent of their total earnings,—and this is the part that is comparable with the total income of those employed on farms.

Additional factors giving rise to differences in money or nominal compensation of farm and factory workers are differences in the cost of food for the two classes of labor; the moneys expended by factory workers and their families for street-car transportation, for which there is no equivalent in the disbursements of the farm population; and a greater certainty of farm occupation. Food on the farm is much cheaper than in towns and cities, and the farm horse or mule conveys, without cost, the farm help from the house to the field when it is more economical to ride than to walk. The greater portion of farm toilers are farm owners and tenants and members of their households, and, while hard times may for the occasion lessen compensation, they do not materially affect the number employed at farm work as do hard times for the factory worker. These factors exert a considerable influence upon the average compensation of farm and factory workers. After allowing for them, it can be seen that the average compensation of factory labor is at least 50 per cent more than the corresponding average for that on farms. The great advance in the average value of farm products since 1890 has, however, appreciably lessened the advantage which in this respect the factory toiler has enjoyed at the expense of those engaged in agriculture. The possible change due to this factor may be noted by the fact that since 1899 the average farm value of agricultural products has increased more than 30 per cent.

Agriculture compared with steam railroads.

More difficulties are encountered in endeavoring to compare the capital invested in agriculture with that of steam railroads than with the capital of manufactures. The Interstate Commerce Commission furnishes a balance-sheet of railroads in which the assets are listed under the heads of—Cost of Railroad, Cost of Equipment, Stock Owned, Bonds Owned, Cash and Current Assets, Materials and Supplies, Sinking Funds and Sundries, and Miscellaneous. The actual value or cost of railroad and equipment is doubtless exaggerated by such statement, owing to the fact that the value of the road and equipment is, in many cases, less than the par value of the securities issued in their construction or acquisition. No such exaggeration is met with either in agriculture or manufactures. The bonds and stocks owned are practically all those of other railroads, and constitute duplications. Omitting them, we have, as the reported nominal or par value of railroad property, the amounts given in the succeeding table:

CAPITAL OF AGRICULTURE COMPARED WITH THAT OF STEAM RAILROADS IN CONTINENTAL UNITED STATES, 1890 TO 1905.

Year	* Agriculture	† Steam railroads
1905 . . .	‡ $27,500,000,000	$14,265,022,174
1900 . . .	§ 22,939,901,164	11,519,570,057
1890 . . .	§ 18,082,267,689	8,962,444,042

*Exclusive of the value of timber lands not on farms, and of government lands used for grazing purposes.

†Including the value of some land and other properties not used for railroad purposes. The values given are based upon the par value of securities outstanding.

‡Estimated.

§Including estimates of the value of agricultural live capital other than live-stock and farming implements.

On the basis of the figures given above, the capital in agriculture is nearly twice that of steam railroad companies, but the capital of those companies is greater than that invested in the business of transporting passengers and freight. The capital invested in this business was computed for the year 1904 by the Bureau of the Census, as $11,244,752,000. Accepting this valuation as an approximate statement of the investments of railroads in the business of transportation, and making it the basis of estimating the commercial values for the years given in the table, the foregoing figures for railroads, which represent the par value of the stocks and bonds outstanding and include the value of properties not utilized in transportation—to be placed on a comparable basis with those of agriculture—must need be reduced by approximately 20 per cent. Allowing such reduction, the capital invested in agriculture on farms is found to be, in each and every year to which the table relates, not far from two and one-half times that employed by steam railroads in the business of transporting passengers and freight. From 1890 to 1905 the capital of steam railroads, as well as of agriculture, increased at approximately the same rate: and thus, in the growth of capital, they kept even pace.

Persons engaged in agriculture and on steam railroads.—The census gives, for 1890 and 1900, the number deriving their support chiefly from agriculture, while the Interstate Commerce Commission reports annually the number of all classes of employees of steam railroads. This latter includes machinists, carpenters, and other shop-men chiefly employed in and about the machinery, car, and repair shops of the companies. The greater number of the men last mentioned are included in the census report of manufactures, and thus, in comparisons with agriculture are counted twice. This fact should be taken into consideration in making deductions from the tables herewith presented. Their number and the value of their services are included in the census of manufactures, which makes that industry one in which certain classes of work are performed even though constituting parts of other industries. In the table which follows there is a separate exhibit of the number of these railroad-shop employees that is duplicated in the statistics of manufactures:

PERSONS ENGAGED OR EMPLOYED IN AGRICULTURE AND UPON STEAM RAILROADS IN CONTINENTAL UNITED STATES, 1890 TO 1905.

Year	Number of persons engaged or employed		
	* In agriculture	By steam railroads	† In railroad machine, car and repair shops
1905	‡11,050,000	1,382,196	279,455
1900	10,381,765	1,017,653	194,270
1890	§9,148,447	749,301	146,270

*Including all persons engaged in gainful pursuits and depending chiefly on agriculture for support.

†Including persons reported by the census of manufactures as employed in that industry (see table, page 6). They are also included among the railroad employees whose numbers are given in the second column of the table.

‡Estimated.

§Includes census estimates of workers omitted by the census of 1890.

From 1890 to 1905, the number of those employed in agriculture increased 20.8 per cent, while the corresponding percentage of increase in railroad employees was 84.5, or more than four times as great. The greater relative increase in the number of railroad employees is in marked contrast with the additions to capital invested. The number engaged in agriculture does not tend to increase so fast as the capital invested in the business, while the opposite tendency is to be noted in steam railroading. In agriculture a great and progressive portion of wealth created goes to capital, while in the other industry such portion goes to labor. The greater relative increase in the number of railroad employees is measured by the ratio of the number of employees in the two industries. In 1890 the number engaged on farms was 12.2 times the number of those employed on steam railroads. The corresponding ratio in 1900 was 10.2, and in 1905, 8.0. In the computation for the foregoing analysis no deductions were made from the census reports of the number engaged in agriculture, as was done in the case of manufactures. The numbers reported for railroad work are more nearly comparable than are those for manufactures, since such numbers are those of persons carried on the pay-rolls of the transportation companies and not the average numbers employed, as in manufactures.

Power employed in agriculture and on steam railroads.—In no industry does the use of artificial power exert the same influence that it does in modern transportation. This fact is disclosed by the table at the bottom of this page, which gives in parallel columns the number of work horses and mules (horses and mules two years old and over) on farms, the tractive power of railroad locomotives as reported by the Interstate Commerce Commission, and the equivalent horse-power of such locomotives computed on the basis employed by the census of manufactures in 1905 as one horse-power for every 3.75 pounds of tractive power.

The average tractive power and the average "horse-power" of locomotives was unquestionably greater in 1905 than in any preceding year, the average having increased from the beginning of the industry. The increase in the horse-power of railroads was therefore greater than indicated by the increase in the number of locomotives. The calculated horse-power of locomotives for 1905 was, according to the table, 50 per cent greater than the number of work horses and mules on farms. Mulhall estimated the horse-power of American railroads in 1896 as 11,760,000. If that estimate was substantially correct, the non-human power on the farm was greater than that of the steam railroads until not far from 1900, when the superiority passed to the steam railroads.

Mechanical work in agriculture and on steam railroads.—If the mechanical energy exerted by persons engaged in agriculture and on railroads is computed on the basis explained for agriculture and manufactures, that energy in 1905 was for agriculture equal to the working capacity of 109,945,000 persons unassisted by animal and mechanical motors; while the corresponding energy exerted by railroads was greater by 38.2 per cent.

Additions to national wealth in agriculture and by steam railroads.—The contributions or additions to national wealth by agriculture are its products not fed to live-stock, less amounts paid to other industries for fertilizers and other materials. These products or the proceeds from their sale are divided between the capitalists owning the land and other farm properties, or from whom farm loans are secured; men and women performing the work on farms; and the government. The division falling to the government is represented by the taxes paid. The corresponding payments by manufactures are the real additions made by that industry to the wealth of the nation. In the case of railroads which perform services but do not have any products corresponding to those of agriculture and manufactures, the amounts divided between stock and bondholders and the government plus the undivided surplus for any given year are comparable from an industrial standpoint with similar contributions of the other two industries, although such contributions, especially those derivable from passenger earnings, are not all strictly additions to national wealth. For purposes of industrial com-

ANIMAL AND MECHANICAL POWER EMPLOYED IN AGRICULTURE AND ON STEAM RAILROADS IN CONTINENTAL UNITED STATES, 1890 TO 1905.

Year	Working horses and mules on farms and ranges	Number of railroad locomotives	*Tractive power railroad locomotives	† Horse power of railroad locomotives
			Pounds	
1905 . . .	‡20,000,000	48,357	1,128,771,082	30,100,560
1900 . . .	18,259,452	37,663	§	§
1890 . . .	‡15,000,000	30,140	§	§

* Exclusive of tractive power of unclassified locomotives.

† Estimated on basis of one horse-power for every 37.5 pounds of reported tractive power.

‡ Estimated on basis explained for corresponding table comparing agriculture and manufactures.

§ Not separately reported.

parisons this economic exception is disregarded, and the portion of agricultural products not fed to live-stock is compared with payments of railroads as stock dividends, interest, taxes, salaries and wages, including those on leased lines, together with all undivided profits. These payments and undivided profits constitute the net income plus payments for salaries and wages. (See table below.)

In the preceding paragraph attention has been called to the fact that the number of railway employees since 1890 has continuously increased faster relatively than has capital, which was not the case in agriculture or manufactures. The table that follows emphasizes the significance of this increase in the number of railroad employees for the period 1900 to 1905. In the earlier of the two years the amount of railroad net earnings was just a little greater than the railroad payments for salaries and wages. Five years later the payments for salaries and wages were more than 13 per cent greater than the net earnings or amounts distributed to stock and bondholders and the government, plus the undivided profits. The figures for the railroads are, for all the roads of the country, considered as a single system and eliminate all duplications due to the holding of railroad stocks and bonds of other railroads. They include, however, some earnings from sources other than from transportation of freight and passengers. Such earnings are of an unreported amount but cannot exceed—and probably do not equal—5 per cent of the total.

ADDITIONS TO NATIONAL WEALTH IN AGRICULTURE AND BY STEAM RAILROADS IN CONTINENTAL UNITED STATES, 1890 TO 1905.

Year	* Value of agricultural products not fed to live-stock, less cost of artificial fertilizers	Net earnings of steam railroads plus payments for salaries and wages		
		Total	‡ Net earnings	Salaries and wages
1905 . .	†$4,500,000,000	$1,582,938,166	$742,993,486	$839,944,680
1900 . .	3,688,698,447	1,114,887,058	557,622,217	557,264,841
1890 . .	†2,900,000,000	§	§	§

* See page 10 for margin of error.
† Estimated.
‡ Includes some earnings from sources other than transportation.
§ Not reported on a comparative basis.

The figures for agriculture, as has been pointed out on page 9, are in error from 15 to 25 per cent in the opposite way. Allowing for the wider margin of error in the total of agriculture, and for an error of only 5 per cent in that for steam railroads, the figures for the total indicate that the contribution of agriculture to the wealth of the nation in 1900 was 4.22 times greater than that of steam railroads; and that the corresponding ratio in 1905 was 3.74. The relative gain of the steam railroads is far greater than that of agriculture, and this gain is largely found in the share which falls to labor.

Remuneration for labor on the farm and on steam railroads.—Reproducing figures presented in the preceding tables, we have the following comparative exhibit of the compensation or earnings of labor employed in agriculture and on steam railroads:

COMPENSATION OF PERSONS ENGAGED IN AGRICULTURE AND ON STEAM RAILROADS IN CONTINENTAL UNITED STATES, 1900 AND 1905.

Year	* One-half the value of farm products not fed to live-stock, less amounts paid for fertilizers	Salaries and wages of employees of steam railroads
1905 . . .	†$2,250,000,000	$839,944,680
1900 . . .	1,844,368,794	557,264,841

*For probable omission in census report, see text, page 10.
†Estimated on basis explained in text, page 9.

On preceding pages it has been pointed out that the census report of the value of farm products does not include the value of or compensation for all the labor performed by those engaged on farms; and, as a result, the figures given in the preceding table as one-half the value of farm products not fed to live-stock, less amount paid for fertilizers, falls short of the probable earnings or compensation of farm toilers by from 20 to 35 per cent. Using the smaller percentage, it is found that in 1900 the farm toilers of this country secured a compensation for their labor which was 3.97 times that of the railroad workers. The corresponding ratio in 1905 was 3.21. Using the larger percentage of possible omission in the farm earnings, the foregoing ratios become 4.47 and 3.62, respectively. The earnings of agricultural toilers are much greater than those of the employees on railroads, but the aggregate pay of the latter is increasing more rapidly than that of the farm workers:

AVERAGE ANNUAL EARNINGS OR COMPENSATION OF THOSE ENGAGED IN AGRICULTURE AND ON STEAM RAILROADS IN CONTINENTAL UNITED STATES, 1900 AND 1905.

Year	* Agriculture	Steam railroads
1905	$226	$608
1900	197	555

*For character of data from which computed, and margin of error, see text, page 11.

The method of computing the figures for agriculture, together with the resulting margin of possible error has already been given on page 11. Allowing a margin of error in the figures of 35 per cent, the average annual earning of railroad employees in 1900 was 2.09 times that of the farm toilers; and in 1905 it was 1.99 times. Allowing a margin of only 20 per cent omission in the census report of the value of products of farm labor, the corresponding ratios were 2.35 and 2.25. Comparing these ratios with others obtained for the two industries, it can be seen that while the capital invested in agriculture and the resulting returns for the use of capital have increased at about the same rate for the past fifteen years; and while the number employed, and the total compensation of railroad employees, have increased faster than capital or the number of farm workers, the average annual compensation of the farm workers has increased faster than has that of the railroads.

Agriculture compared with minor industries.

Agriculture, manufactures, and steam railroads are the three most important industries in the United States. Of other industries, the census published statistics for 1902 relating to mines and quarries, street and electric railways, electric light and power stations, and telegraphs and telephones. The same office had published statistics for some of the industries mentioned in 1889 or 1890. As a rule, the character of the industries and the basis on which the census statistics are collected make the information more or less noncomparable with the data relating to agriculture collected for 1890, 1900 and 1905. So far as the published statistics are comparable, they are presented in the tables that follow.

Capital invested in agriculture and in minor industries.— In 1890, the census sought to obtain a report of the capital invested in mines and quarries that would make the resulting statistics comparable with the corresponding statistics of manufactures. On the basis of the information collected, the census reported an aggregate capital invested in mines and quarries in 1890 of $1,287,709,840. An analysis of the other facts secured led to the conclusion that the total was not comparable with the figures secured for any other industry, and disclosed so many difficulties in the way of obtaining a true exhibit of mining capital that no effort was put forth to collect the same in 1902, the year for which other statistics of the industry were collected.

A special census for 1902 reported that the cost to date of the construction and equipment of street and electric railways was $2,167,634,047, and for all electric light and power stations, $504,740,352. Of the cost last mentioned, $482,719,879 was assigned to private plants, and $22,020,473 to those owned by municipalities. A similar census for the same year reported that the capital stock and bonds outstanding of telegraph systems was $164,946,525, and for telephone systems, $348,031,054. The division of the census office making report on the wealth of the nation prepared special estimates for the four industries last mentioned, for the years 1900 and 1904. The estimates thus prepared are of the commercial value of the several properties, and are more comparable with the census returns of farm values than are the figures mentioned above; and for that reason they are employed in the accompanying table:

CAPITAL INVESTED IN AGRICULTURE AND SPECIFIED INDUSTRIES IN CONTINENTAL UNITED STATES, 1900 TO 1905.

Industry	1905	1904	1900
*Agriculture	$27,500,000,000	. . . .	$22,939,901,164
†Street and electric railways . .	. . . .	$2,219,966,000	1,676,197,160
Privately owned electric light and power stations	. . . .	562,851,105	402,618,653
†Telegraph systems	. . . .	227,400,000	211,650,000
†Telephone systems	. . . .	585,840,000	400,324,000

*For basis of estimates for 1905, and character of data upon which report for 1900 is prepared, see page 4.

†Commercial valuation of system estimated by the Bureau of the Census for its volume on Wealth, Debt and Taxation.

The relative importance of publicly and privately owned electric light and power stations has been given in a preceding paragraph. Only the privately owned can properly be considered in comparisons with agriculture, manufactures, and railroad transportation. Assigning mines and quarries a value one-half that of street and electric railways, it is seen how insignificant is the capital of any one or all of these minor industries, as compared with that of agriculture. The figures for these industries are estimates, but give a fair picture of the relative importance of these minor industries.

Persons engaged in agriculture and in minor industries.—The census report relating to street and electric railway companies gave for 1902 the total number and the average number employed in the industry. The figures given in the table show the average number employed. The total number employed for the same industry was 140,769. The figures for agriculture have already been explained. Those for electric light and power stations, telegraph and telephone stations are the aggregate numbers carried on the pay-roll.

PERSONS ENGAGED OR EMPLOYED IN AGRICULTURE AND SPECIFIED INDUSTRIES IN CONTINENTAL UNITED STATES, 1890 TO 1905.

Industry	*1902 and 1905	1900	1890
Agriculture	(1905) 11,050,000	10,381,765	9,148,447
Mines and quarries	(1902) 619,856	. . . .	539,830
Street and electric railways . .	(1902) 134,369	. . . .	70,764
Privately owned electric light and power stations	26,909		
Telegraph systems	(1902) 78,752		
Telephone systems	(1902) 27,627		

*The numbers in parentheses in the second column indicate in all cases the years to which the numbers relate.

The number employed in municipal electric light stations in 1902 was 3,417. These were in addition to those included in the table. The total number employed in the five industries in 1902 was 887,513. This number, when taken in connection with the compensation of these workers, will give a better idea of the importance of all these minor industries as compared with agriculture than can be secured in any other way.

Power employed in agriculture and in minor industries.—The power utilized in agriculture in 1900 and 1905, and in the various minor industries in 1902, is shown in the following table :

Animal and Mechanical Power Employed in Agriculture and Specified Industries in Continental United States, 1900, 1902, and 1905.

Industry	Animal and mechanical power employed
	Horse-power
Agriculture (1905)	20,000,000
Agriculture (1900)	18,259,452
Mines and quarries (1902)	2,998,056
Street and electric railways (1902) .	1,359,435
Privately owned electric light and power stations (1904)	1,639,177
Telegraph, telephone, and fire-alarm systems (1900)	3,148

The figures in the parentheses in the first column give in every case the year for which the horse-power is reported.

The horse-power of the motors used in the municipally owned electric-light plants not included in the table was 158,263. The five industries mentioned utilized animal and mechanical power amounting in 1902 to 6,019,816 horse-power, or less than one-third the power of working horses and mules on farms two years previous.

Additions to national wealth by agriculture and the minor industries.—The data reported by the census relating to minor industries do not permit of any statement—even approximately—of the additions made by them to the national wealth ; hence, none is here attempted. However, those additions are doubtless shown in a relative way by the compensation given to labor. Taken as a whole, the wealth creations or compensation for services performed, less payments to other industries for materials, were not far from twice the compensation paid to labor. If this fact is kept in mind, a fair judgment may be reached concerning the contributions of those industries as a whole to the world's wealth. It is that the farmers of the United States add several times more to the world's wealth than do the workers in all these minor industries.

Remuneration of labor on farms and in minor industries.—The following table presents an exhibit, according to the census reports, of the payments as salaries and wages to employees in minor industries in 1902. With them are included the calculated compensation of those engaged in agriculture. The character and the source of the figures given for agriculture in 1900 and 1905 have already been explained at length on pages 9 and 10 :

Compensation for Persons Engaged in Agriculture and in Specified Industries in Continental United States, 1900, 1902, and 1904.

Industry	Compensation
Agriculture (1905)	$2,250,000,000
Agriculture (1900)	1,844,349,223
Mines and quarries (1902)	408,980,512
Street and electric railways (1902) .	88,210,449
Privately owned electric light and power stations (1904)	18,766,970
Telegraphs (1902)	15,039,673
Telephones (1902)	36,255,621

The figures in the parentheses of the first column give in every case the year for which the horse-power is reported.

The salaries and wages paid by municipally owned electric-light and power stations, not included in the above, amounted to $1,879,722. The aggregate included in the table for the five industries was $567,253,325. This was less than one-third of the compensation or earnings of agriculture in 1900 ; and about one-fourth that of agriculture in 1905. The average for the 887,513 persons employed in the five industries in 1902 was $639 ; while the corresponding averages for agriculture in 1900 and 1905, when allowance is made for the value of all farm products, on which is calculated the average earnings of farm workers, were $267 and $305, respectively. The average for these industries was, therefore, more than twice that of the corresponding average for agriculture in its most prosperous year.

Agriculture compared with all other industries.

The United States census prepared estimates of the commercial value of all forms of material wealth for the years 1900 and 1904. For the purposes of this article, that wealth may be divided into four classes : (1) Property employed in the various industries ; (2) property belonging to the nation, state, and municipal governments, and to charitable, and educational institutions (this is given in the census report under the title "property exempt from taxation"); (3) property used solely for residential purposes ; and (4) personal possessions. Under the latter are included clothing and personal adornment, carriages, and kindred properties. The value of the properties mentioned in (2) and (4) are specifically estimated by the census; the others are given under the titles "real property taxed" and property of specified industries. The census, however, presents a conditional estimate of the value of residential property for 1900. This for individual states may be, and probably is, subject to a considerable margin of error which does not attach to the total for the United States. The latter is here used with the belief that its employment involves but a small margin of error. Subtracting this census estimate from the total wealth reported, less the amounts reported for (2) and (4), we have the approximate aggregate for (1); subtracting from this the capital invested in agriculture, we have an approximate statement of all the

Plate II. Haying scene in Rhode Island. Grass is the fundamental agricultural crop in temperate parts of the earth

capital invested in all industries other than agriculture. The table which follows summarizes in the manner indicated the wealth of the United States for 1900:

WEALTH OF CONTINENTAL UNITED STATES BY SPECIFIED CLASSES, 1900.

Wealth in agriculture .	$22,939,901,164	
Wealth in all other industries	32,443,510,331	
Total wealth in all industries		$55,383,411,495
Property belonging to governments and other exempt real property	$6,212,788,930	
Residential property . .	20,041,106,350	
Clothing and personal adornment	2,000,000,000	
Furniture, carriages, and kindred properties . .	4,880,000,000	
Total property other than that in industries . .		33,133,885,280
Total wealth of continental United States .		$88,517,296,775

According to the foregoing exhibit, the capital invested in agriculture in 1900 constituted 25.9 per cent of the national wealth, and 41.4 per cent of all wealth used for productive or industrial purposes. The wealth invested in agriculture was greater than that used for residential purposes by those not deriving their support from farms; and the farm wealth was 70.7 per cent of the wealth invested in all other productive enterprises, including those passed in review and all others. With the growth of all modern industries, agriculture is still the most important factor of national wealth and well-being.

AGRICULTURE IN THE DOMINION OF CANADA

The character of agriculture as an industry, whether considered by itself or in comparison with other industries, is substantially the same in the Dominion of Canada as in the United States. The differences are mainly those that arise from the different totals of the tillable area in the two countries and the relative extent to which that area has been brought into cultivation. In the United States a greater percentage of land available for agricultural purposes has been brought into farms than in Canada and, hence, the census statistics of agriculture as compared with those of manufactures are even more defective in the latter than in the former country. The agricultural resources of the Dominion greatly exceed those exhibited by farm statistics. This fact should be kept in mind in using the figures that follow, which are taken from the Canadian census of 1901.

Agriculture compared with manufactures.

Making allowance for the unreported live capital in Canada as has been done in the agricultural statistics of the United States, the capital invested in farming and in manufacturing in Canada for the year specified was as follows:

Form of Wealth	Agriculture	Manufactures
Land and buildings .	$1,403,269,501	$96,644,827
Implements, machinery and tools	108,665,502	112,733,831
Live-stock	275,167,627	
Cash and sundry live capital	200,000,000	237,537,829
Total	$1,987,102,630	$446,916,487

Farm capital is over four times that of manufactures, the two industries in this respect having in 1901 the relative proportions that they had in the United States not far from 1880. The relative increase in manufacturing capital is at the present time materially greater than that of farm capital.

The Canadian census reports only the number of wage-earners in agriculture and, hence, the only comparable labor statistics available for the two industries are those giving the average earnings of the wage earners. In 1901 that average for male agricultural workers was $207.55; for similar workers in forestry and lumber, $305.07; and for manufacture, $403.14. The first and last differ but little from the averages obtained for the same classes of labor from the more complete census returns of the United States.

The horses over three years old employed on Canadian farms were reported as numbering in 1901, 1,304,910. The horse-power of the mechanical motors in Canadian factories in the same year was 652,653. In this respect, the farm still outranks the factory, as it also does in the mechanical work performed in the two industries by man aided by horse and machine.

Agriculture and railways compared.

The Canadian yearbook gives the total investments in steam and electric railways in the Dominion in 1900 as $998,268,405, while in 1906 they aggregated $1,396,356,675. The corresponding capital for agriculture in 1901 was, approximately, $1,987,102,630. The figures for agriculture are more nearly comparable with those of railways in 1900 than in 1906. Allowing for the difference in the years, it becomes probable that the farm capital in 1901 was over twice that of steam railways and a little less than twice that of the combined steam and electric railways.

Literature.

The facts and figures employed in this article were derived from governmental publications. From the following reports the reader may collect the essential facts: United States Census Reports, Agriculture, 1880, 1890 and 1900; Manufactures, 1880, 1890, 1900 and 1905; Occupation, 1900; Wealth, Debt and Taxation, 1902; Abstract of Twelfth Census, 1900. United States Department of Agriculture Report; Yearbooks, 1880–1907. Dominion of Canada Census Reports, Agriculture, Manufactures and Occupations, 1901; The Yearbook of Canada, 1906.

IMPORTS AND EXPORTS OF AGRICULTURAL PRODUCE

By *O. P. Austin*

Agricultural products form one-half of the foreign commerce of the United States. Their total value, both in imports and exports, grows from year to year, but the percentage they form of the total imports and exports of the country declines slowly because the manufacturing industries are steadily and rapidly increasing their proportion in the foreign commerce of the country. The value of agricultural products imported has grown from $325,000,000, in 1880, to $625,000,000, in 1907, speaking in round terms; and the value of agricultural products exported has grown from $686,000,000, in 1880, to $1,055,000,000, in 1907, having crossed the billion dollar line for the first time in the fiscal year 1907. Notwithstanding this growth, however, the percentage that agricultural products form of both imports and exports is less in 1907 than a decade or two decades earlier.

In 1907, agricultural products formed 43½ per cent of the total imports, and in 1897, 52½ per cent. Agricultural exports formed, in 1907, $56\frac{6}{10}$ per cent of the total domestic products exported, in 1897, 66¼ per cent, in 1887, 74⅗ per cent, and, in 1880, 83¼ per cent. Meantime manufactures, which formed but 15 per cent of the exports in 1880, 21 per cent in 1890 and 35½ per cent in 1900, formed in 1907 practically 40 per cent of the total exports of domestic products. So, when the statement is made that the share which agricultural products form of our exports is declining, it should be understood that this is not due to a decline in the total value of agricultural products exported, but merely to the fact that the proportionate growth in the exportation of manufactures has been more rapid than that of agricultural products.

Increase in agricultural exports.

In the early period of our history, agricultural products naturally formed the bulk of exports, ranging above 80 per cent of the total in nearly all of the first half of the nineteenth century. In 1800, they amounted to $26,000,000, but formed 80.4 per cent of the total exports of domestic products. In 1850 they amounted to $109,000,000 and formed 80.5 per cent of the total. Even as late as 1860 they formed 81 per cent of the exports. During the war period the exports of agricultural products fell off greatly and the percentage they formed of the total dropped as low as 60 per cent in 1865. At the close of the war, however, the proportion that agricultural products formed of the total exports increased slowly and ranged between 70 and 80 per cent down to 1895, when it fell to 69.7 per cent and has gradually declined, until in 1907 it was 56.6 per cent of the total exports. During the same time, however, the total value of agricultural products exported has slowly but steadily advanced and, as above indicated, it crossed the billion dollar line in 1907, being in that year $1,055,000,000, against $976,000,000 in 1906 and $821,000,000 in 1905.

This increase in recent years, and especially the large increase in 1906 and 1907, should not be looked upon, however, as an evidence of a great increase in the quantity of agricultural products spared for exportation, but rather as the result of higher prices received for the material exported. In fact, of many of the important articles forming the great group of agricultural products exported, the quantity sent out of the country has declined and may be looked upon as steadily declining. This is especially true with reference to food-stuffs.

Decline in amount of food-stuffs exported.

The rapid growth in population of the United States and the trend of population toward the manufacturing centers has produced a much more rapid growth in that element of our population which may be termed non-productive, so far as relates merely to agricultural products. The growth of manufacturing in the United States has been in recent years very rapid, much more so than that of agricultural production. The total value of manufactures produced in the United States in 1880 was a little less than $5,500,000,000, and in 1906 was between $16,000,000,000 and $17,000,000,000, including in this total all articles included in the earlier censuses of manufactures. We may safely say that the value of manufactures produced at the present time is fully three times as great as in 1880.

Meantime, the value of farm products, which was set down by the census of 1880 at $2,250,000,000, was given by the census of 1900 at but $3,750,000,000. The number of persons engaged in manufacturing was given in 1880 at about 2,750,000, and in 1905 at about 5,500,000, having thus practically doubled meantime; while the number of persons engaged in agriculture was given in 1880 at 7,750,000 and in 1900 at 10,500,000, the increase during that period being less than 50 per cent. While no census of agriculture was taken in 1905, as was the case with reference to manufactures, these figures comparing conditions in agriculture and manufactures respectively, in 1880, with the latest available official figures make it quite apparent that the growth in manufacturing and in the number of persons so employed has been much more rapid than in the agricultural industry.

It is not surprising, therefore, in view of the special attention the manufacturing industries are now receiving from the people of the United States, and the apparent drift away from agriculture toward manufacturing, that the proportion of agricultural products in our exports is declining. Nor is it surprising that, of articles required for food, the quantity available for exportation is declining.

This decline in the quantity of food articles exported is distinctly marked when we compare quantity with quantity and omit the values, which have not, because of the advance in price, declined so rapidly as those of quantity. The total value of the great group classed by the Bureau of Statistics as "breadstuffs," in which are included wheat, flour, corn, oats, and the other grains, does not show such a very large decline, being, in 1907, $184,000,000 value, and in 1906, $186,000,000, against an annual average of $216,000,000 in the period since 1890, but the quantity shows a much greater reduction. For instance, wheat exports, including in that term both the wheat and the flour reduced to terms of wheat, fell in 1905 and 1906, for the first time since 1890, below the 100,000,0000-bushel line, being in 1905 but 44,000,000 bushels and in 1906 but 98,000,000, while the domestic product retained for consumption increased from 381,000,000 bushels in 1890 and 361,000,000 in 1900 to 595,000,000 in 1906.

Corn exports, which are never large in the natural form, ranged much lower in the period 1902–1907 than in the period 1896–1901, the average in the second period being less than one-half that of the earlier period, this decline in corn exportation being, however, chiefly due to the fact that producers find it more profitable to turn their corn into meat before exporting than to export it in the natural state.

Even of meats the quantity exported does not materially increase. The quantity of canned beef exported increased only 10,000,000 pounds in the period from 1897 to 1906, the quantity being in 1897, 54,000,000 pounds, and in 1906, 64,000,000. Fresh-beef exports actually declined during the same period, being, in 1897, 290,000,000 pounds, and in 1906, 268,000,000, although the value meantime increased about $2,000,000. Bacon shows a marked decline, having been 500,000,000 pounds in 1897 and but 361,000,000 in 1906. The 361,000,000 pounds exported in 1906 actually brought more money than the 500,000,000 pounds exported in 1907, the total value of bacon exported in 1906 being nearly $36,000,000, against $34,000,000 in 1897. Hams show a very slight increase in exportation—165,000,000 pounds in 1897 and 194,000,000 in 1906, though the value in 1897 was but $16,000,000, and in 1906, $20,000,000. Lard increased in exportations from 568,000,000 pounds in 1897 to 741,000,000 in 1906, an increase of about 30 per cent, while the value increased more than 100 per cent, being $29,000,000 in 1897 and $60,000,000 in 1906.

Agricultural exports in general.

Thus it is apparent that of food-stuffs, the quantity that we are able to spare for our neighbors in other parts of the world is declining rather than increasing, and that the increase in value, about which we hear from time to time, is due to higher prices. Meat and dairy products exported, as already indicated, show a marked decline in the quantity of most of the articles, but the value grew from $139,000,000 in 1897 to $211,000,000 in 1906. Even in cotton, of which there has been a slight advance in the quantity exported, the principal growth in the value has been due to advance in price. The quantity of cotton exported in 1897, 3,104,000,000 pounds, brought $231,000,000, while 4,518,000,000 pounds exported in 1907 brought $481,000,000, the increase in quantity being a little less than 50 per cent, and the increase in value more than 100 per cent.

The principal articles forming this enormous total of $1,000,000,000 worth of agricultural products exported are cotton, meats, food animals and breadstuffs. The cotton is, of course, of the upland variety. The meats are chiefly fresh beef, amounting to $26,000,000 in 1907; bacon, $26,000,000; hams, $24,000,000; salted or pickled pork, $15,000,000, and lard, $57,000,000. The food animals are chiefly cattle, valued in 1907 at $35,000,000. The breadstuffs are chiefly wheat, $60,000,000 in 1907; flour, $62,000,000, and corn, $44,000,000; while oats, which were $16,000,000 in 1906, an abnormal year in the exportations of this class of grain, fell to less than $2,000,000 in 1907. There are certain other agricultural products of no inconsiderable importance. Cottonseed oil, for example, a product of agriculture that has passed through a process of manufacture, amounted to $17,000,000 in 1907; cottonseed oil-cake and meal, also $17,000,000; fruits and nuts, $17,500,000; flaxseed meal, $8,500,000, and tobacco, $33,000,000; while there are numerous less important articles exported, such as vegetables, $4,000,000; seeds, $10,000,000; hops, $3,500,000; butter, $2,500,000, and cheese, $2,000,000.

Agricultural imports.

That the United States, the world's largest producer of breadstuffs and meats and cotton, should be importing $600,000,000 worth of agricultural products annually, and indeed making nearly one-half of its total imports products of agriculture, seems somewhat anomalous; yet it is a fact that of the total imports, amounting to $1,434,000,000 in 1907, $625,000,000 are products of the soil and have been frequently designated under the general title of "products of agriculture." While in a few of the important articles thus classed some doubt may arise as to the entire propriety of the grouping, clearly the bulk of this $625,000,000 is beyond question of agricultural production. To make up this total of agricultural products imported, we include sugar, coffee, tea, cacao, fibers, silk, India rubber and hides and skins; though as to the propriety of including this last-named article, there may be a serious doubt. However, as this has been for many years included in the estimate made of agricultural products imported, it is retained in this estimate of importation of products of agriculture into the United States.

The grand total produced by these and other agricultural products has grown, as already indicated, from $325,000,000 in 1880, $374,000,000 in 1890 and $420,000,000 in 1900, to $625,000,000 in 1907, having thus practically doubled in value since 1880; while the value of agricultural products exported was increasing less than 50 per cent. Even this increase of practically 100 per cent in the value of agricultural products imported does not tell the full story, because we are not now including in our figures of imports and exports the merchandise brought from Hawaii and Porto Rico, now customs districts of the United States, and which is nearly all agricultural in its character.

The sugar coming from Hawaii in the fiscal year

1907 amounted to $27,500,000, and that from Porto Rico, $15,000,000. Sugar forms the largest single item in agricultural products imported, that coming from foreign countries in 1907 amounting to $93,000,000; and, if to this we add $27,500,000 from Hawaii and $15,000,000 from Porto Rico, we get a grand total of $135,000,000 worth of sugar brought into continental United States in the fiscal year 1907, against $99,000,0000 in 1897. Here, again, a part of the increase is due to higher prices, the quantity brought in having only increased from 4,919,000,000 pounds in 1897, to 5,622,000,000 in 1907, an increase of about 15 per cent, while the value has increased 36 per cent.

The other important articles of food imported are coffee, which shows but little increase during the decade, having grown from 738,000,000 pounds in 1897 to 985,000,000 in 1907; and tea, which shows a decline from 113,000,000 pounds in 1897 to 86,000,000 in 1907; while cacao shows a very rapid increase, the quantity imported having grown from 31,000,000 pounds in 1897 to 92,000,000 in 1907, and the value from less than $3,000,000 in 1897 to over $13,000,000 in 1907.

It is in that class of agricultural products required for use in manufacturing that the largest growth has been made in recent years. Fibers increased in importations from a $12,000,000 value in 1897 to $42,000,000 in 1907; raw cotton, from less than $6,000,000 in 1897 to $20,000,000 in 1907; silk, from a $19,000,000 value in 1897 to $71,000,000 in 1907. Wool importations in 1897 were abnormally large, in anticipation of the prospective change in tariff which in 1897 transferred wool from the free to the dutiable list. As a consequence the importations of wool in 1897 were 350,000,000 pounds, valued at $53,000,000, against 204,000,000 pounds, valued at $41,000,000 in 1907. Silk also shows a marked advance in price, the 6,500,000 pounds of raw silk imported in 1897 being valued at but $18,500,000, while the 16,750,000 pounds imported in 1907 were valued at $70,000,000, the quantity having thus increased but about 150 per cent, while the value increased nearly 300 per cent.

Countries receiving our exports.

The sections of the world with which our foreign commerce in agricultural products deals are, speaking in very round terms, Europe as the purchaser and consumer of our exports, and the tropics as the producers and suppliers of our imports. This statement is, of course, in very general terms. In fact, however, nearly all of the raw cotton, which now forms about one-half of our exports of agricultural products, goes to Europe, the only non-European countries taking any cotton of consequence being Japan and Canada, and the amount taken by Canada is small. Of the $481,000,000 worth of cotton exported in the fiscal year 1907, the United Kingdom took $213,000,000, Germany $122,000,000, France $53,000,000, Italy $30,000,000, Spain $15,000,000, Belgium $8,000,000, Russia $6,500,000, and the rest of Europe $11,000,000; while Japan took $14,000,000, Canada $8,000,000, and all other parts of the world less than $1,000,000. So Europe purchases and consumes nearly all of our exported cotton.

The same may be said of our wheat, our corn, and, in a rather more limited way, our meats. The wheat exports of 1907 amounted to $60,000,000 in value and the flour exports to $62,000,000. Of this $122,000,000 worth of wheat and flour exported in that year, $42,000,000 worth went to the United Kingdom, $9,000,000 worth to Germany, $7,000,000 to Italy, $8,000,000 to Belgium, $10,000,000 to Netherlands, of which sum probably a portion passes on to other European countries, especially Switzerland, and approximately $12,000,000 to the rest of Europe, thus indicating that about three-fourths of our wheat goes to Europe.

The remainder goes chiefly to tropical America. Cuba takes $3,000,000, other West Indies $4,000,000, and Mexico and Central America, about $4,000,000. Japan and China have recently developed a considerable taste for American flour, the value of the exports of flour to China in 1907 being over $6,000,000, against less than $500,000 in 1906 or 1905. To Hongkong, practically $4,000,000 worth of flour was shipped, and to Japan, nearly $4,000,000 in 1907, against $4,500,000 in 1906 and over $5,000,000 in 1905 when large quantities were imported for use of the Japanese army. This demand for American flour in the Orient is of recent development, and seems to be of spontaneous growth, since the European demand for American wheat and flour is so great that our producers and exporters do not find it necessary to make any special efforts to push their products in any part of the world.

Of the meats exported, the bulk, as in the case of flour, goes to Europe, though the tropical sections of the world, especially tropical America, take considerable quantities of bacon, hams, and lard from the United States. Nearly all of the fresh beef exported in 1907, of which the exportations amount to $26,000,000 a year, and of live cattle for beef purposes, of which the exportations amount to $40,000,000 a year, went to the United Kingdom. Of the $26,500,000 worth of fresh beef exported in the fiscal year 1907, practically $26,000,000 went to the United Kingdom; and of the $42,000,000 worth of cattle exported in 1906, about $38,000,000 went to the United Kingdom, showing that that comparatively small country with its population of 43,000,000 is the chief purchaser of the large quantities being sent out of this country.

The total value of beef products exported in 1907, including in this term fresh beef, canned, salted and beef otherwise cured, and tallow, was practically $40,000,000, and of this amount about $31,000,000 worth went to the United Kingdom; while, as above indicated, the value of live cattle sent out of the country in 1906 was $42,000,000, of which practically $38,000,000 went to the United Kingdom, that term including England, Scotland, Ireland and Wales. Of the $33,000,000 worth of tobacco exported, nearly all went to Europe, chiefly to the United Kingdom.

Countries supplying our imports.

Turning to the agricultural imports and the countries from which they are drawn, it may be said first that the principal articles forming the agricultural imports are sugar, coffee, tea, cacao, for food; hides and skins, wool, silk, and fibers for manufacturing, also India rubber, which has been included in the group, "agricultural imports," since the growth of rubber-producing trees and plants is now becoming an established industry, agricultural in its character.

Nearly all of these articles, with the exception of wool, are of tropical, or at least subtropical, production. Of the $93,000,000 worth of sugar imported from foreign countries in 1907, $71,000,000 came from Cuba, $8,000,000 from the Dutch East Indies, $3,000,000 from South America, about $2,000,000 from the West Indian islands, other than Cuba, and about $8,000,000 worth of beet-sugar from Europe. In addition to this, there was about $28,000,000 worth of sugar from the Hawaiian islands and $15,000,000 worth from Porto Rico. Thus, of the $136,000,000 worth of sugar coming into the country, all but about $8,000,000 worth originated in tropical countries and was produced from cane, the $8,000,000 worth imported from Europe being produced from beets.

Of the $83,000,000 worth of hides and skins imported in 1907, $32,000,000 worth was goatskins, originating chiefly in tropical countries. Ten million dollars' worth originated in the East Indies, over $3,000,000 in Mexico, about $4,000,000 in South America, $3,250,000 in China, $2,000,000 in other parts of Asia and Oceanica, and about $7,000,000 worth in Europe. Of the $21,000,000 worth of hides of cattle imported in 1907, about $10,000,000 worth came from South America, about $2,000,000 worth from Mexico, and $2,250,000 worth from India.

Of the $42,000,000 worth of unmanufactured fibers imported in 1907, about $11,000,000 worth was Manila hemp, coming chiefly from the Philippines, about $9,000,000 worth was jute, mostly from India, about $15,000,000 worth was sisal from Mexico, while $2,250,000 worth was flax, chiefly from Europe. In addition to this, there was imported $29,000,000 worth of burlaps made from jute grown in India, $22,500,000 worth coming direct from that country and $6,500,000 worth coming from the United Kingdom, which, doubtless, drew either the burlaps or the material for their manufacture from India. Of the $41,500,000 worth of wool imported in 1907, $17,000,000 worth was from Asia and Oceanica, about $6,000,000 worth from South America, $4,500,000 from China, and and about $12,000,000 from the United Kingdom. Of the $71,000,000 worth of raw silk imported in 1907, $40,000,000 worth was from Japan, $10,000,000 from China, and $17,000,000 from Italy.

Of the $60,000,000 worth of India rubber imported, $33,000,000 worth was from Brazil, about $4,000,000 from Mexico and Central America, $8,500,000 from the United Kingdom, and $11,000,000 worth from other countries of Europe. Of the $26,000,000 worth of tobacco imported in 1907, $13,500,000 worth was from Cuba, $8,000,000 from Netherlands, chiefly wrapper-tobacco produced in her East Indian island of Sumatra, and valued at more than one dollar per pound in the import statements. Thus, as above indicated, Europe takes the bulk of our agricultural exports and the tropics supply the bulk of our agricultural imports.

Value of imports and exports.

The table that follows shows the total value of agricultural products imported into the United States in each fiscal year from 1890 to 1907, and their proportion of the total imports:

Fiscal year	Agricultural imports	Total imports	Share which agricultural products form of total imports
			Per cent
1890 . . .	$373,954,000	$789,310,000	47.38
1891 . . .	408,475,000	844,916,000	48.34
1892 . . .	427,196,000	827,402,000	51.63
1893 . . .	415,406,000	866,401,000	47.95
1894 . . .	357,938,000	654,995,000	54.65
1895 . . .	373,116,000	731,970,000	50.97
1896 . . .	391,029,000	779,725,000	50.15
1897 . . .	400,871,000	764,730,000	52.42
1898 . . .	314,292,000	616,050,000	51.02
1899 . . .	355,515,000	697,148,000	50.99
1900 . . .	420,139,000	849,941,000	49.43
1901 . . .	391,932,000	823,172,000	47.61
1902 . . .	413,745,000	903,321,000	45.80
1903 . . .	456,199,000	1,025,719,000	44.47
1904 . . .	461,434,000	991,087,000	46.56
1905 . . .	553,851,000	1,117,513,000	49.56
1906 . . .	554,175,000	1,226,562,000	45.18
1907 . . .	625,127,000	1,434,421,000	43.55

The following table shows the principal tropical and subtropical products for one year, imported during the fiscal year ending June 30, 1907, including shipments from Hawaii and Porto Rico:

Articles	Value of imports
Cane-sugar and molasses	$127,354,000
Silk	71,412,000
Coffee	78,384,000
India rubber and gutta percha . . .	59,121,000
Fibers	42,254,000
Tobacco and manufactures of	35,608,000
Fruits and nuts	37,041,000
Cotton (mostly Egyptian)	20,996,000
Vegetable oils	15,395,000
Gums	14,974,000
Cocoa, chocolate and manufactures of	14,579,000
Tea	13,916,000
Spices	5,113,000
Rice	4,548,000
Opium	3,068,000

The table that follows shows the value of our exports during a long term of years and the proportion which products of agriculture and manufacture, respectively, form of the total domestic exports in each of the years named:

EXPORTS OF AGRICULTURAL PRODUCTS AND MANUFACTURES FROM THE UNITED STATES, 1820 TO 1907, AND PROPORTION OF EACH IN THE TOTAL DOMESTIC EXPORTS FOR THE YEARS NAMED.

Fiscal year	Exports of agricultural products		Exports of manufactures	
	Value	Per cent of total domestic exports	Value	Per cent of total domestic exports
1820	$41,603,749	80.50	$7,792,544	15.08
1830	46,977,332	80.27	9,579,195	16.38
1840	92,548,067	82.88	15,425,180	13.81
1850	108,605,713	80.51	23,223,106	17.21
1851	145,903,778	81.68	29,002,441	16.24
1852	124,375,837	80.28	27,169,868	17.54
1853	154,239,296	81.23	30,938,215	16.29
1854	170,716,858	79.28	37,554,878	17.55
1855	145,423,788	75.45	40,136,880	20.82
1856	218,290,649	81.93	39,159,444	14.70
1857	227,558,727	81.59	41,088,938	14.73
1858	201,632,408	80.22	40,024,391	15.90
1859	222,909,718	80.07	45,693,612	16.41
1860	256,560,972	81.13	48,453,008	15.32
1861	149,492,026	72.96	43,904,876	21.43
1862	135,143,076	74.24	35,044,915	19.51
1863	174,580,806	69.86	44,840,359	24.10
1864	147,765,862	67.30	35,205,660	24.54
1865	156,662,846	60.46	40,771,104	29.79
1866	382,770,457	81.78	51,588,280	15.28
1867	289,981,616	75.17	58,570,090	20.93
1868	276,254,779	74.55	59,952,782	22.26
1869	267,236,930	72.02	61,026,706	22.18
1870	361,188,483	79.35	70,040,845	18.62
1871	368,466,011	77.07	89,409,396	20.86
1872	368,796,625	77.41	86,393,766	20.16
1873	446,900,004	77.69	101,035,757	20.01
1874	501,371,501	79.16	107,150,839	18.81
1875	430,306,560	76.95	101,961,547	20.42
1876	456,113,515	76.67	105,909,768	20.14
1877	459,734,148	72.63	144,186,602	24.45
1878	536,192,873	77.07	139,126,450	20.45
1879	546,476,703	78.12	133,423,501	19.10
1880	685,961,091	83.25	121,818,298	14.78
1881	730,394,943	82.63	135,279,162	15.30
1882	552,219,819	75.31	162,000,185	22.09
1883	619,269,449	77.00	160,444,747	19.95
1884	536,315,318	73.98	155,973,319	21.51
1885	530,172,966	72.96	150,256,178	20.67
1886	484,954,595	72.82	145,665,027	21.87
1887	523,073,798	74.41	149,150,329	21.21
1888	500,840,086	73.23	154,068,702	22.53
1889	532,141,490	72.87	165,896,805	22.72
1890	629,820,808	74.51	178,982,042	21.18
1891	642,751,344	73.69	188,311,113	21.58
1892	798,328,232	78.69	183,076,682	18.02
1893	615,382,986	74.05	179,008,987	21.57
1894	628,363,038	72.28	199,804,463	23.33
1895	553,210,026	69.73	205,057,865	25.84
1896	569,879,297	66.02	258,008,885	29.89
1897	683,471,139	66.23	311,243,365	30.15
1898	853,683,570	70.54	324,527,921	26.81
1899	784,776,142	65.19	380,386,843	31.59
1900	835,858,123	60.98	484,846,235	35.30
1901	943,811,020	64.62	465,777,992	31.88
1902	851,465,622	62.83	453,864,851	33.48
1903	873,322,882	62.73	467,898,377	33.61
1904	853,643,073	59.48	523,319,979	36.47
1905	820,863,405	55.03	611,425,574	40.98
1906	976,047,104	56.81	686,023,169	39.93
1907	1,055,257,800	56.90	740,314,557	39.94

CHAPTER II

THE HISTORICAL EVOLUTION OF NORTH AMERICAN AGRICULTURE

BACK OF THE PRESENT CONDITION of any industry lies a long line of slowly evolved incident and progress. This accumulating experience expresses itself in the present status. It is necessary to take a retrospect of former conditions. It will aid us in making our prospect. It will be impossible to enter into any full discussion of the historical movements, but we may make the reviews sufficiently extended to enable us to appreciate the way by which we have come. First, we shall discuss the agricultural condition of the Indians; then we shall follow the progress under white men; then we shall review the history of the agricultural press, since the press is such a responsive index of agricultural activity at any time. As an appendix to the article on the press, a list of current agricultural papers is inserted as a matter of record; and this list will afford something of an index of the intellectual activity of the present day as compared with former and future times.

The history of agriculture is yet to be written. We are now obliged to confine ourselves to literary sources, mentioning such bold historical events as chanced to be recorded in travels, reports, journals and books. The real history of agriculture will be economic and social. We shall endeavor to determine just how the people lived, how they did their work, what they raised and how they sold it, and what the commercial values were. We have yet scarcely begun to write agricultural history in this way. We are still tied to the idea of recording and discussing "events." It is the common people, not the king or the president or a general or congress, that make history. Most of the events that we record are only the results of movements originating away back with the people, and we must attempt to discover the causes and the trends of these movements. Until within a century, the history of the human race has been practically the history of agriculture.

The articles comprising Chapters II and III are probably the fullest general statement yet made of the history of North American agriculture. Many special articles have been published in journals, reports, and elsewhere, on the histories of particular regions, particular rural occupations and particular men, but these cannot be reviewed in a work of this character. The horticultural history, so far as a literary treatment of it will suffice, is indicated in the article "Horticulture" in the Cyclopedia of American Horticulture. The general histories of agriculture in English are surprisingly few. One of the best, although very brief, is C. W. Hoskyns' " A Short Inquiry into the History of Agriculture in Ancient, Mediæval and Modern Times," London, 1849. Standard references on ancient agriculture are Bradley, "Survey of the Ancient Husbandry and Gardening," 1725; and Daubeny, "Lectures on Roman Husbandry," London, 1857. Some of the works in German that may be consulted with profit are: Chr. Ed. Langethal, "Geschichte der teutschen Landwirtschaft," 4 books, 1847. C. Fraas, "Geschichte der Landbau-und Forstwissenschaft, seit dem sechzehnten Jahrhundert bis zur Gegenwart," Munich, 1865 (excellent). "Geschichte der österreichischen Land-und Forstwirtschaft und ihrer Industrien," 1848–1898, 6 vols. (Published on the occasion of the fiftieth anniversary of the reign of Emperor Francis Joseph I). Th. F. Von der Goltz, "Geschichte der Deutschen Landwirtschaft," 2 vols., 1902 (discusses also the social history). The student of the history of agriculture must, of course, be familiar with general history, and with the technical discussions in numbers of contributions on related economic and social topics.

We are much in need of a philosophical treatment of the history of agriculture on this continent. We are to expect such a treatment to come out of the studies that are now beginning to be made in rural economy in the colleges of agriculture and elsewhere. If this treatment is good enough to serve as a base for economic and social studies, it will constitute a worthy life-work for any ambitious and well prepared student.

ABORIGINAL AGRICULTURE—THE AMERICAN INDIANS

By *G. K. Holmes*

Before the coming of the white man, the Indians of that part of North America north of Mexico depended for their food on hunting and fishing, the utilization of many wild plants and their products, and on the cultivation of plants which, although comparatively few in number, were often of large economic importance. Their clothing was made mostly of the skins of wild animals. The Pueblos had garments of cultivated cotton, while the southern and Pacific Indians had some bark-fiber fabrics. For domestic industry, for pipe-smoking, for medicine, and for other purposes, many kinds of plants, mostly wild, were used. Nowhere were there any permanently domesticated animals, except the turkey and the wolf-dog. Throughout large areas, agriculture in the full sense was the chief dependence for food; in extensive areas, the harvesting of wild plants and their products; and, elsewhere, hunting and fishing; in all regions there was a varying combination of these three dependencies.

Environment.

Surroundings determined the degree of agriculture, of wild-plant harvesting, and of hunting and fishing for food. It determined clothing, domestic industry, and all individual and social uses of the Indians. As is well stated by Otis T. Mason, there were twelve ethnic environments, the features of which, pertinent to this article, follow:

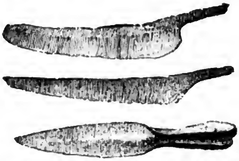

Fig. 1. Copper knives known to have been used by Indians of the Northwest Territory.

(1) Arctic.—Intense cold, no timber, little fruit, almost complete dependence upon animal life for food, clothing, and other wants. (2) Yukon-Mackenzie.—Abundant trees providing many materials, but otherwise dependence upon animal life. (3) St. Lawrence and lake region.—Great forests, berries, wild rice, corn, squash, beans, large dependence upon animal life. (4) Atlantic slope.—Rich lowlands, fertile piedmont, waters abounding in aquatic life, plant life varied and abundant, great forests furnishing materials for supplying a large diversity of wants, climate very favorable to agriculture. (5) Gulf coast.—Climate ranging from temperate to subtropical, abundant rain, rich river valleys, conditions highly favorable to agriculture. (6) Mississippi valley (not including the Great Plains).—Varied climate, abundant rainfall, fertile land, alternate timber and prairie, great variety of economic plants, no obstacles to agriculture. (7) Plains.—Some trees and scant supply of economic plants, not adapted to Indian agriculture, animal life chief dependence. (8) North Pacific coast.—Moist temperate climate, immense forests, abundant land- and sea-animal life, great variety of wild economic plants—all conducive to satisfying Indian wants in all seasons without agriculture. (9) Columbia-Fraser region.—Rich lands, mild climate, textile plants, excellent forests, abundance of edible fruits and roots, resources so manifold in all seasons and physical features so varied that there was no inception of agriculture. (10) Interior basin.—Largely arid, timber scarce except in mountains, wild seeds abundant, many land animals, conditions unfavorable to agriculture. (11) California-Oregon.—Equable temperate climate, adequate rainfall, region well, but not heavily, timbered, many useful plants for food, textiles, and the like, varied land- and sea-animal life, so that there was no inducement to engage in agriculture. (12) Pueblo country.—Arid and semi-arid region, economic plant life comparatively meager, animal life insufficient for food, and a scantiness of economic conditions leading to irrigation for agriculture.

Indian diet.

In that part of the northern portion of the continent that abundantly supplies plant-food, the Indian diet was three-fourths animal food, in the southern part three-fourths vegetal, while in all regions it varied according to food-supply and with the seasons. The most important cultivated food-plant was corn, which was the Indians' principal subsistence east of the Great Plains within the corn zone. Of much consequence as cultivated food-plants were beans, squashes, pumpkins and sunflowers. Tobacco and gourds were prominent. The seeds, roots, fruits, and other parts of many kinds of wild plants were used as food. Textile fibers were obtained from many wild plants and the cotton plant was cultivated. Trees and woody shrubs also supplied fibers.

Vegetal food-stuffs were preserved by drying, and the preservation of corn, mesquite beans, acorns and the like, gave rise to granaries and other storage devices. Animal food was often dried, smoked, or frozen. Dried meat was sometimes pulverized and mixed with grease, berries, or similar substances, forming pemmican. Fruits were dried for preservation, nuts were often ground before being stored, as were also acorns, grass seeds, and beans. Tubers were frequently stored in the ground or near the fireplace.

Infusions of leaves, fruits, and of various herbs were drunk by the Indians as medicine, but no stimulating beverage of the character of tea or coffee has been observed. Drinks made from fruit, as cider from manzanita berries, and a beverage made from cactus fruit, are the beverages best known, the latter fermented. It is doubted that the Indians had discovered the fermentation of corn to make beer; if not, they soon learned it from the whites.

As the chief cultivated food-plant of the Indians, corn had been raised from time immemorial, the plant having found its way geographically through Mexico from countries farther south. Jacques Cartier observed large fields of growing corn in 1534 where Montreal now stands. Champlain, in 1604, found it in cultivation at almost every point visited, from Nova Scotia to far up the Ottawa river. The supplies of corn obtained from the Indians by the New England and Virginia colonists are well known; by means of them the settlements of the whites in these colonies became permanent. Hennepin, Marquette, Joliet, LaSalle, and other early French explorers, found all the tribes they visited from Minnesota to the Gulf and even into Texas cultivating corn. The same was true of the tribes between northwestern Mexico and the plains of Kansas when visited by Coronado in 1540–42. Even the Mandan and Arikara on the upper Missouri had their corn patches when first seen by the whites. How far northward on the Pacific slope the cultivation of corn had extended at the time of the discovery is not known. Evidence that it or anything else was cultivated in California west of the Rio Colorado valley is still lacking.

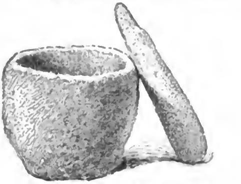

Fig. 2. Mortar and pestle used for grinding corn and other grains.

The importance of corn to the Indian is indicated by the reports of explorers. It seems evident from the history of the expeditions of De Soto and Coronado that the Indians of the Gulf states and of the Pueblo region relied chiefly on corn for food. It is also probable that a large fraction of the food-supply of the Indians of Virginia and the Carolinas and of the Iroquois and Huron tribes was derived from the cultivation of corn. Du Pratz says that the Indians "from the sea [Gulf] as far as the Illinois" made corn their principal subsistence. The amount of corn of the Iroquois destroyed by Denonville in 1687 has been estimated at more than a million bushels, but this estimate may be too large. According to Tonti, who took part in the expedition, the army was engaged seven days in cutting up the corn of four villages. General Wayne, writing in 1794 of the Indian settlements, asserts that "the margins of these beautiful rivers, the Miamis of the Lake and the Au Glaize, appear like one continued village for a number of miles, both above and below this place, Grand Glaize, nor have I ever before beheld such immense fields of corn in any part of America, from Canada to Florida."

No complete list of the cultivated and wild plants utilized by the Indians in that part of America north of Mexico can be made. The accompanying cultivated list is probably nearly complete, but the list of wild plants is incomplete and must be regarded as embracing for the most part only the chief plants that attracted the attention of explorers and early observers as being utilized by the Indians. The only complete lists of plants utilized by Indians, within a very restricted region, were made by F. V. Coville for the Klamath Indians and by V. K. Chesnut (p. 27) for the Mendocino county Indians in California. These lists are not here merged with the general list for the United States, nor used to contribute to that list; the Mendocino list has been condensed for this article.

PLANTS USED BY INDIANS BEFORE ADVENT OF WHITES

[Collected from writings of travelers and investigators; incomplete, but containing chief plants; medicinal plants omitted; many plants of industrial and ceremonial uses unrepresented; independent of Mendocino county list below.]

CULTIVATED.

Name, common or botanical	Parts used, and use
Artichoke, Jerusalem	Tubers—food.
Beans, common (*Phaseolus vulgaris*), many varieties	Seeds—food.
Bean, Lima (*P. lunatus*), in southern part of country	Seeds—food.
Bean, scarlet-runner (*P. multiflorus*)	Seeds—food.
Chilli (*Capsicum frutescens*), several varieties, "bell peppers," etc.	Fruits—relish.
Chilli (*C. annuum*), "bird peppers"	Fruits—relish.
Corn, Indian (varieties)	Seeds—food.
Sweet (varieties)	Seeds—food.
Pop (varieties)	Seeds—food.
Cotton	Fibers—woven fabrics, thread, twine.
Gourds (many kinds)	Fruits—water-jugs, dippers, spoons, dishes, mixing-bowls, pottery-smoothers, rattles, sounders for rasping stick, roof drains, masks, parts of ornaments, etc.; flowers—food, coloring, ceremonial.
Grape	Fruits—food.
Grasses	Stems—baskets, mats, and other industrial uses.
Mexican tea plant (*Chenopodium ambrosioides*)	Seeds—to thicken broths; leaves—for flavoring food; stalks—ashes used for salt.
Onion	Bulbs—food.

CULTIVATED, continued.

Name, common or botanical	Parts used, and use
Passion flower	Fruits—food.
Pumpkin, varieties (*Cucurbita Pepo*)	Fruits, fresh and dried—food.
Squash: Winter varieties (*C. maxima*)	Fruits—food.
Winter crookneck varieties (*C. moschata*)	Fruits—food.
Cymlin and summer crookneck varieties (*C. Pepo*, var. *condensa*)	Fruits—food.
Sunflower	Seeds—food and coloring.
Tobacco (varieties)	Leaves and stems—pipe-smoking.

HARVESTED WITHOUT CULTIVATION.

Name, common or botanical	Parts used, and use
Agave	Fibers—textiles; leaf and leaf matrix—food; sap—fermented drink.
Artichoke, Jerusalem	Tubers—food.
Bark of many kinds of trees and other plants	Fibers—thread, yarn, twine, rope, wallets, baskets, mats, shawls, sandals, cooking pots, dishes, and many textile utensils.
Bearberry (*Arctostaphylos Uva-Ursi*)	Leaves—pipe-smoking.
Berries, some dried:	
Barberry	Fruits—food.
Bayberry	Wax—candles.
Blackberry	Fruits—food.
Buffaloberry	Fruits—food.
Cranberry	Fruits—food.
Dewberry	Fruits—food.
Elderberry	Fruits—food.
Gooseberry	Fruits—food.
Hackberry	Fruits—food.
Huckleberry, blue	Fruits—food.
Huckleberry, black	Fruits—food.
Juniper berry	Fruits—food.
Manzanita berry (*Arctostaphylos Manzanita*)	Fruits—food and drink.
Mulberry (*Morus rubra*)	Fruits—food; bark—twine, clothing.
Partridgeberry	Fruits—food.
Raspberry, red	Fruits—food.
Raspberry, black	Fruits—food.
Salal (*Gaultheria Shallon*), a sort of wintergreenberry	Fruits—food.
Serviceberry, Juneberry (*Amelanchier Canadensis*)	Fruits—food.
Squawberry (*Rhus trilobata*)	Fruits—food.
Strawberry	Fruits—food.
Thimbleberry	Fruits—food.
Wintergreenberry	Fruits—food.
Calamus	Roots—food.
Camas	Bulbs—food.
Canes	Stems, split—mats, baskets.
Canoe birch	Bark—canoes.
Cedar	Poles and bark—dwellings; bark—clothing.
Chokecherry (varieties)	Fruits, fresh and dried—food.
Coonti (*Zamia integrifolia*)	Roots—food.
Currant, black	Fruits—food.
Cypress	Bark—dwellings; wood—canoes.
Dogwood, "red willow" (*Cornus sericea*)	Cambium layer—pipe-smoking; wood—arrows.
Elm	Bark—withes to bind dwelling poles, fish lines, nets.
Gourds	See cultivated list.
Grape	Fruits—food.
Ground nut (*Apios tuberosa*)	Tubers—food.
Haw (*Cratægus* spp.)	Fruits—food.
Honey (of bumble-bees)	Nectar of flowers—food.
Ilex Cassine	Leaves—decoction of, for making "Black Drink" to produce nervous disorder in ceremonials.
Indian bread-root, prairie turnip (*Psoralea esculenta*)	Tubers—food.
Indian cherry, Carolina buckthorn (*Rhamnus Caroliniana*)	Fruits—food.
Indian cucumber (*Medeola Virginiana*)	Rootstocks—food.
Indian fig; Prickly pear (*Opuntia vulgaris*)	Fruits—food.
Giant cereus	Fruits—food.
Indian hemp; (*Apocynum cannabinum*)	Stems—fiber.
(*Asclepias incarnata*)	Stems—fiber.
(*A. pulchra*)	Stems—fiber.
Indian tea: Labrador tea (*Ledum Grœnlandicum*)	Stems and leaves—drink.
Sassafras tea, or Saloop tea	Bark of roots and branches—drink.
Canada, or Wintergreen tea (*Gaultheria procumbens*)	Stems and leaves—drink.
Indian tobacco (not true tobacco): (*Lobelia inflata*)	Leaves—pipe-smoking.
Mouse-ear everlasting	Leaves—pipe-smoking.
Mullein	Leaves—pipe-smoking.
Indian turnip	Bulbs—food.
Jimson weed (*Datura meteloides*)	Seeds—narcotic drink.
Kalmia (Mountain laurel, sheep laurel, ivy, etc.)	Wood—spoons.
Kouse	Roots—bread.
Maple and box-elder	Sap—sirup and sugar.
Mesquite: (*Prosopis juliflora*)	Wood—fuel, parts of houses, furniture, etc.; seeds and pods—food.
(*P. pubescens*) screw-pod	Seeds and pods—food.
Nuts: Beech	Nuts—food.
Black walnut	Nuts—food.
Butternut	Nuts—food.
Chestnut	Nuts—food.
Chinkapin	Nuts—food.
Hazel (varieties)	Nuts—food.
Hickory (Shagbark and Shellbark)	Nuts—food.

Harvested Without Cultivation, continued.

Name, common or botanical	Parts used, and use
Nuts: Oak	Acorns—food.
Pecan	Nuts—food.
Pine	Nuts—food.
Paint, dye, stain: Bloodroot (*Sanguinaria*)	Rootstocks—coloring.
Hoary puccoon (*Lithospermum canescens*)	Roots—coloring.
Indian redroot (*Gyrotheca capitata*)	Roots—coloring.
Strawberry blite (*Blitum capitatum*)	Calyxes—coloring.
Tradescantia sp.	Flowers—coloring.
Wild indigo (*Baptisia* spp.)	Stems and leaves—coloring.
Yellow puccoon (*Hydrastis Canadensis*)	Roots—coloring.
Passion flower	Fruits—food.
Persimmon	Fruits—food.
Pine	Poles—dwellings; sap—turpentine for industrial uses.
Plum	Fruits—food.
Potato (varieties)	Tubers—food.
Reeds	Stems—mats, baskets, to cover dwellings.
Rose-bush (varieties)	Cambium layer—pipe-smoking.
Rushes	Stalks—mats.
Slippery elm	Inner bark—food.
Soapberry: (*Sapindus saponaria*)	Berries—soap, cleansing.
(*S. marginatus*)	Berries—soap, cleansing.
Squirrel corn, Indian potato	Bulbs—food.
Sumac (*Rhus aromatica*)	Leaves—pipe-smoking.
Sumac (*Rhus trilobata*)	Fruits—food; twigs—baskets.
Tobacco (varieties)	Leaves and stems—pipe-smoking.
Trees, many kinds	Wood—mortars, pestles, platters, splints, benches, bows, arrows, canoes, paddles, dwellings, many implements of industry, agriculture, etc.
Tuckahoe truffles, or Indian bread (*Pachyma Cocos*)	Plants—food.
Water chinkapin (*Nelumbo lutea*)	Seeds—food.
Wild cherry	Fruits—food.
Wild rice (*Zizania aquatica*)	Seeds—food.

Wild Plants Used by Indians of Mendocino County, California. No Plants Cultivated.

[United States Department of Agriculture—Contributions from the United States National Herbarium, Vol. 7, pp. 294–422, by V. K. Chesnut. In the case of these Indians, a contemporaneous study of their relation to plants has been made; and a list is here given as an example of Indian usage.]

Name, common or botanical	Parts used, and use
Porphyra laciniata, a seaweed	Whole plant, green or baked—food.
Ergot	Whole plant—medicine.

Wild Plants Used by Indians of Mendocino County, California. No Plants Cultivated, continued.

Name, common or botanical	Parts used, and use
Black moss, a lichen	Whole plant—famine food.
Yellow moss, a lichen	Whole plant—bedding material and medicine.
"Moss" (*Usnea lacunosa*)	Whole plant—bedding material.
Puffball	Skin—paraphernalia of medicine men.
Bracket fungus (*Polyporus* sp.)	Whole plant—food.
Boletus sp.	Whole plant—food.
Common field mushroom	Whole plant—food.
Fly-poison mushroom	Whole plant—poison.
Alsia abietina, a moss	Whole plant—bedding material, especially for babies.
Maidenhair fern	Leaf stems—for keeping ear-ring holes open and enlarging them.
Five-fingered maidenhair fern	Stems—withes for baskets.
Gymnogramma triangularis, a fern	Stems—basket-making.
Polypod fern	Juice—medicine.
Common bracken fern	Root wood—splints for baskets; whole plant—medicine.
Common scouring rush (*Equisetum variegatum*)	Stems—surrogate for sandpaper, medicine for sore eyes.
Yew	Wood—bows.
California nutmeg	Nuts, roasted—food; wood—tooth-picks; roots—strands for making baskets.
California juniper	Fruits, boiled—food.
Cedar, or incense cedar	Sprigs—leaching acorn meal; small limbs—bows; leaves—medicine.
Sugar pine	Seeds—food.
Yellow or bull pine (*Pinus ponderosa*)	Wood—lumber; gum—chewing; pitch—medicine.
Digger pine	Nuts—food; cambium layer—famine food; gum—chewing; pitch—medicine; wood—drums for dances; roots—fibers for baskets.
Douglas spruce	Wood—lumber; roots—baskets; leaves—surrogate for coffee, medicine.
Giant coast redwood	Wood—lumber, canoes.
Cat-tail	Roots and bases of stems—food; down of the fruiting part—beds.
Sagittaria latifolia	Tubers—food.
Wild oats	Seeds—food (pinole, or meal of parched seeds).
Bromus marginatus	Seeds—food (pinole).
Wild wheat (*Elymus triticoides*)	Seeds—food (pinole).
Foxtail grass (*Hordeum murinum*)	Seeds—food (pinole).
Darnel	Seeds—food (pinole).

WILD PLANTS USED BY INDIANS OF MENDOCINO COUNTY, CALIFORNIA. NO PLANTS CULTIVATED, continued.

Name, common or botanical	Parts used, and use
Sedges, several species	Stems—ropes, baskets; rootstocks—fibers for baskets.
Common rush	Stems—baskets, fish-traps.
Soaproot (Spanish *amole*)	Bulbs—soap, medicine, fish stupefier; hair-like covering—brushes, also for beds and surrogate for hair in mattresses; young shoots—food.
Poison camas	Bulbs—poison, medicine, etc.
Allium Bolanderi	Bulbs—food.
Allium unifolium	Bulbs and leaf bases, fried—food.
Calochortus Maweanus, C. pulchellus; C. venustus	Bulbs, raw or roasted—food.
Dichelostemma capitatum.	Bulbs, raw or roasted—food.
Erythronium giganteum	Bulbs—food, medicine.
Hesperoscordum lacteum	Bulbs, raw or cooked—food.
Harvest brodiæa (*Hookera coronaria*)	Bulbs, raw or roasted—food.
Camas (*Quamasia Leichtlinii*)	Bulbs—food.
"Highland potato" (*Triteleia laxa*)	Bulbs—food.
Triteleia peduncularis	Bulbs—food.
Trillium sessile giganteum	Tuber-like rhizomes—medicine.
Smilax	Limbs—strands for basket-making.
Iris or blue flag	Leaves—fibers for ropes, nets, etc.
Limodorum giganteum	Roots—medicine.
Fremont cottonwood	Bark—medicine.
Willow (*Salix argyrophylla*)	Roots and limbs—basket-making, arrows, etc.
S. lasiolepis	Wood—fuel; bast—rope; bark—medicine, dyestuff.
Mountain alder	Bark—dyestuff, medicine.
Hazelnut (*Corylus Californica*)	Nuts—food; twigs—baskets, fish-traps.
Golden-leaf chinkapin	Nuts—food.
Oaks, all species growing in Mendocino county	Acorns—food (specially prepared flour); bark and galls—medicine, dyeing, tanning.
Mistletoe	Leaves—medicine, chewed "all day long" to relieve toothache; decoction to produce abortion.
Razoumofskya occidentalis	Whole plant—medicine.
Asarum caudatum	Roots—medicine.
Sour grass (*Eriogonum latifolium*)	Roots and other parts—medicine.
Yard grass (*Polygonum aviculare*)	Whole plant—medicine.
Common dock	Leaves—food (for greens); seeds—food (for mush).
Pigweed (*Amaranthus retroflexus*)	Leaves—food (for greens); seeds—food (pinole).
Calandrinia elegans	Seeds—food (pinole).
Claytonia perfoliata	Plant, raw or cooked—food (Indian lettuce).
Common yellow pond-lily	Seeds—food.
Common virgin's bower	Stems and leaves—medicine.
Sleeproot (*Delphinium nudicaule*)	Roots—medicine, "causing an opponent to become stupid while gambling."
Buttercup	Seeds—food (pinole).
Common aromatic meadow rue	Herbage—medicine.
Oregon grape (*Berberis repens*)	Root bark—medicine.
California laurel (*Umbellularia Californica*)	Nuts—food; leaves—medicine and to repel fleas.
Yellow California poppy	Roots and leaves—medicine; leaves—food.
Cream cup (*Platystemon Californicus*)	Leaves—food (greens).
Common yellow mustard	Leaves—food (greens).
Shepherd's purse	Seeds—food (pinole).
Water cress	Leaves—food (relish).
Verbena hastata	Seeds—food (pinole).
Lace-pod (*Thysanocarpus elegans*)	Whole plant—medicine; seeds—food (pinole).
Syringa (*Philadelphus Gordonianus*)	Young shoots—arrows, baskets for carrying papooses.
Prickly gooseberry	Fruits—food.
Smooth gooseberry	Fruits—food.
Tellima affinis	Roots—medicine.
Therofon elatum	Roots—medicine.
Mountain mahogany	Wood—arrow tips, digging sticks, spears, fighting clubs.
Strawberry	Fruits—food.
Wild rose	Fruits (hips)—food.
Thimbleberry	Fruits—food.
Black raspberry	Fruits, fresh or dried—food (most important berry of region).
Blackberry	Fruits, fresh or dried—food; roots—medicine.
Serviceberry	Fruits—food; wood—arrows.
Common thorn (*Cratægus rivularis*)	Fruits—food; wood—fuel.
Toyon, or Christmas berry	Berries, fresh or cooked—food; bark and leaves—medicine.
Wild or chokecherry (*Cerasus demissa*)	Fruits, fresh or dried—food; bark—medicine.
Wild plum	Fruits, fresh or dried—food.
Redbud	Bark and wood—baskets; bark—medicine.
Lathyrus Watsoni, a vetch	Whole plant—food (greens), medicine.
Lupine, two species	Young plants—food (greens).
Common bur-clover	Young plants—food.
Psoralea macrostachya	Inner bark—fibers for thread; root-fibers—hunting bags and ropes.
Clover, several species	Foliage, flowers, seeds—food.

WILD PLANTS USED BY INDIANS OF MENDOCINO COUNTY, CALIFORNIA. NO PLANTS CULTIVATED, continued.

Name, common or botanical	Parts used, and use
Turkey mullein (*Croton setigerus*)	Leaves—medicine, stupefying fish.
Poison oak (*Rhus diversiloba*)	Leaves—medicine.
Wild red-fruited sumac	Berries—medicine.
Large-leaved maple	Inner bark—baskets.
California buckeye	Nuts—food; bark—medicine; wood—twirling sticks for fire-making.
California lilac (*Ceanothus integerrimus*)	Young shoots—baskets; seeds—food (pinole).
Rhamnus Californica	Bark—medicine (the *Cascara sagrada* of the early Spanish settlers).
R. Purshiana	Bark—medicine (the *Cascara sagrada* of commerce).
R. ilicifolia	Bark—"good medicine."
Wild grape	Fruits—food; vines—basket rims.
Blazing star (*Mentzelia lævicaulis*)	Leaves—medicine.
Datisca glomerata	Roots and leaves—"good fish medicine."
Boisduvalia densiflora	Seeds—food (pinole).
Godetia albescens	Seeds—food (pinole); leaves—"decoction good for sore eyes."
California spikenard (*Aralia Californica*)	Roots—medicine.
Angelica sp.	Roots—medicine; sprouts—food.
Anise (*Carum Kelloggii*)	Tubers—food; seeds—food (pinole); root fibers—brushes.
Cow parsnip (*Heracleum lanatum*)	Leaves and flower-stalks—food; roots—medicine.
Lomatium utriculatum	Leaves—food.
Sanicula tuberosa	Bulbs—food.
Madroña (*Arbutus Menziesii*)	Fruits—food; wood—lodge poles, tools, etc.; leaves—medicine.
Manzanita, two species; the common manzanita (*Arctostaphylos Manzanita* and *A. tomentosa*)	Leaves—medicine; berries—food, cider.
Huckleberry	Berries—food.
Shooting star (*Dodecatheon Hendersoni*)	Roots and leaves—food.
Oregon ash	Branches—pipes; wood—canes, handles, tools, etc.; roots—medicine.
Common Indian hemp (*Apocynum cannabinum*)	Fibers—rope, nets, thread, garments, etc. (chief reliance for fiber).
Milkweed (*Asclepias eriocarpa*)	Juice—medicine; fibers—rope, strings.
Linanthus ciliatus	Flowers—surrogate for coffee; plant—medicine.
Yerba santa	Leaves—medicine, surrogate for tobacco.
Amsinckia lycopsoides	Young shoots—food.
Cynoglossum grande	Roots—food, medicine.
Plagiobothrys campestris	Leaves—dyestuff, food; seeds—food (pinole).
Yerba buena (*Micromeria Chamissonis*)	Leaves—surrogate for tea.
Monardella Sheltonii	Leaves—surrogate for tea, medicine.
Pogogyne parviflora	Seeds—food (pinole); leaves—medicine, to repel fleas.
Salvia columbariæ	Seeds—food.
Trichostema lanceolatum	Plant—fish-poison, medicine.
Jimson weed	Leaves—medicine.
Nicotiana Bigelovii	Leaves—pipe smoking.
Black nightshade	Berries—food.
Mimulus guttatus	Plant—food, surrogate for lettuce.
Lonicera interrupta	Leaves—medicine; stems—basket withes.
Elder	Berries—food; flowers—medicine; wood—squirt guns, whistles, flutes, etc.
Snowberry	Twigs—brooms; branches—arrows, pipe stems.
Big-root (*Micrampelis marah*)	Seeds and roots—medicine.
Scorzonella maxima	Roots—food.
Yarrow	Plant—medicine.
Achyrachaena mollis	Seeds—food (pinole).
Dog fennel	Plant—medicine.
Wormwood	Plant—medicine.
Baccharis consanguinea	Wood—arrows.
Blepharippappus platyglossus	Seeds—food (pinole).
Coleosanthus Californicus	Leaves—surrogate for tea.
Gum plant (*Grindelia* sp.)	Plant—medicine; leaves—surrogate for tea.
Helenium puberulum	Leaves and flowers—medicine.
Hemizonia luzulaefolia	Seeds—food (pinole).
Madia dissitiflora	Seeds—food (pinole).
M. densifolia	Seeds—food (pinole).
Matricaria discoidea	Leaves—medicine.
Petasites palmata	Stems and leaves—ashes used for salt; roots—medicine.
Short-stemmed sunflower (*Wyethia longicaulis*)	Seeds—food (pinole); roots—medicine.
Horehound	Plant—medicine.

Virginia Indians.

In that branch of the Algonquin family commonly known as Virginia Indians, every family, at the time when the white people founded Jamestown, had its garden and field of ground, generally 100 to 200 feet square, that was carefully cultivated. In clearing new land, the trees were girdled near the ground by bruising the bark. When sufficiently dried, the trees were felled by the aid of fire and stone axes and the stumps burned. In preparing a field, the ground was worked over by the men with wooden instruments made somewhat like mattocks or hoes with long handles. The weeds and corn-stubble were dug up and allowed to dry, then made into small heaps and burned.

The woman's planting implement, which she used sitting, was about a foot long and five inches broad. Beginning at the corner of the field, the woman made with this implement a series of holes about three feet apart, into every one of which, at intervals of about an inch, she placed four grains of corn and two beans, and covered them with earth. The rows were about three feet apart. Within the unoccupied spaces were planted pumpkin, squash, sunflower and other seeds.

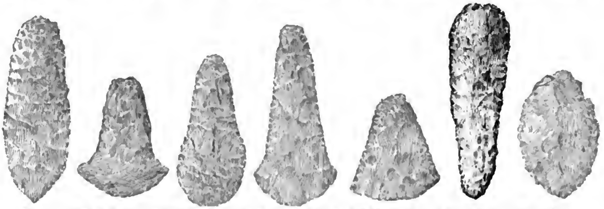
Fig. 3. Types of flint agricultural implements used by the Indians of North America. The size varies from eight to twelve inches in height.

Occasionally, a vegetable of one kind occupied a bed by itself, but usually various species were grown together in one field. The gardens were kept carefully weeded by the women and children. When the corn was about half grown it was hilled. Little houses or shelters, raised upon platforms in the fields, were occupied by watchers, whose duty it was to keep the birds from injuring the crops.

Corn, beans, pumpkins, squashes, tobacco, and the sunflower were raised in these gardens. To this list may be added the Mexican tea plant, the seeds of which were used to thicken broths, and the saline ashes of its stalk to season broths and stews.

According to Smith and Strachey, the Indians also planted the passion flower. There were cartloads of its fruit in every cultivated field. Beverley, however, says that it grew spontaneously, and that, while the Indians often ate the fruit, they did not take the trouble to plant it.

There were four varieties of corn—two early and two late. One of the early kinds was but three or four feet high and bore an ear about the size of a "case-knife handle." Two crops of this variety could be raised in one season. The second kind of early corn grew to a height of nine or ten feet with an ear seven or eight inches in length. The kernels of both early varieties were plump and well filled out.

The two varieties of late corn were recognized by the shape of the kernel—the first, known as flint corn, having a plump grain; the other, called "she" corn, with a dent or depression in the outer end of the kernel. The ears were of various colors, some being white, yellow, or red; others blue, or variegated.

The beans of the Virginia Indians were of several colors and several sizes. The "pease" noted by the early Virginia writers were a variety of small bean, perhaps the pea-bean. The pumpkin is generally supposed to have been grown by most of the agricultural tribes as far north as the St. Lawrence river.

Squashes were cultivated in several varieties. They were usually cooked before ripening, when the shell and seeds were tender. Some varieties furnished the gourds from which cups, bowls, ladles, and rattles were made. The sunflower was cultivated for its seeds, which were used to make both "bread and broth."

Tobacco (*Nicotiana rustica*), called by the Virginia natives "apooke," is described by Strachey as being poor and weak in comparison with that of the West Indies. Its height was rather less than three feet, its blossom yellow, and the leaf short, thick, and rounding at its upper end. The plant was dried over a fire or sometimes in the sun, and crumbled to powder, stalk, leaves and all. It was usually grown in a bed by itself.

The gardens of the principal chiefs of the Virginia Indians were planted by the people, who met by appointment, and with "such diligence worketh as for the most part all ye kings corne is set on a day."

In harvesting, the corn was picked and placed in hand baskets, then emptied into larger baskets. The ears were thoroughly dried upon mats, care being taken to protect them from the dew by covering them at night. When sufficiently dried, the corn was placed in the house in piles and shelled by "wringinge the eares in peices betwene ther hands." The shelled corn was placed in a great storage basket which "taketh upp the best part of some of ther howses." Corn was sometimes cached.

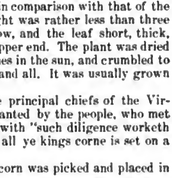
Fig. 4. Type of harvesting basket used by the Indians of the Great Interior basin.

Smith writes that during March and April the

Virginia Indians lived principally on turkeys, squirrels, and fish. In May and June, they planted their fields and subsisted on fish, acorns and walnuts; or they were dispersed in small companies and collected fish, game, crabs, oysters, land tortoises, and wild fruits. In June, July, and August their food consisted mostly of fish, berries, green corn and roots of the "tuckahoe." The above list is of course not exhaustive. In the fall, the natives fared quite sumptuously on the products of their fields. After the harvest, came their customary hunting expedition westward toward the mountains in search of deer and other game, which had become scarce in the vicinity of the villages. During the winter months their food consisted of corn, beans, nuts, acorns, dried fruit and berries, and all the game that they could secure.

Fish and meat were preserved by drying on hurdles over the fire or upon spits. Oysters were strung upon strings, cured in smoke, and packed in baskets. Fruits and berries were dried upon mats and stored for future consumption. Chestnuts were eaten raw or made into meal. Walnuts were eaten after the usual manner or were crushed between stones and the oil extracted by boiling in water; they were also crushed in a mortar with water and used with stews. Acorns were dried on hurdles over the fire, then prepared by boiling. Seeds, including wild rice (*Zizania aquatica*), and roots of many kinds were collected. Among the more important roots were "ground nuts" (*Apios tuberosa*) and "tuckahoe," which "groweth like a flagge in marishes. In one day a Salvage will gather sufficient for a weeke." The term "tuckahoe" seems to have been applied to roots of various species as well as to a fungus (*Pachyma cocos*) growing underground in sandy pine barrens.

The main reliance of the Virginia Indians for food during a considerable portion of the year was corn. The importance of this cereal as a winter food is shown by the large amount in storage. In 1610, Captain Argoll obtained by barter from the Chief Potawomack nearly 400 bushels of corn and beans. Captain Smith procured from Powhatan two or three hundred bushels of corn for a pound or two of blue glass beads. At another time he "wrangled out of" this chief 80 bushels of corn for a copper kettle.

A large amount of green corn was consumed, generally after it had been roasted or boiled. The late corn of these Indians, if not wholly ripe when gathered, was parched in hot ashes to preserve it. Meal was prepared by grinding dried corn in a mortar and sifting through a basket sieve, the meal being received on a wooden platter. Parched meal was often eaten dry or with the addition of a little water. Cakes were made from corn, wild rice, or sunflower seeds, ground and mixed with water, and baked in hot ashes or boiled. Many kinds of stews and pottage that were both palatable and nutritions were prepared. Food was fairly abundant and there were but few months in the year when even the most improvident natives were not well supplied. The yearly round of diet embraced a great variety of articles, some of which are highly esteemed by epicures.

New England Indians.

Agriculture was common to the New England tribes. Much of the coast region south of the Saco river, Maine, was under tillage. The high, rocky shores of the central and eastern portion of Maine were not suitable to agriculture, but the fertile river valleys in the interior of this state and throughout New England generally had their well-cultivated gardens, wherein were grown corn, beans, pumpkins, squashes, artichokes, and tobacco.

According to Williams, "the women of a family will commonly raise two or three heaps [of corn] of twelve, fifteene, or twentie bushells a heap, which they drie in round broad heaps; and if she have helpe of her children or friends, much more." A family would, therefore, commonly raise from twenty-four to sixty bushels of unshelled corn. This apparently does not include the considerable amount of green corn that was consumed. Judging by the average yield of the ordinary field of the New England farmer of today, which is but a reproduction of an Indian garden, and taking into consideration the somewhat larger yield of modern varieties of corn, it seems probable that an amount of land ordinarily under cultivation by a single New England Indian family would be from half an acre to about one and one-half acres. This estimate is corroborated by Gookin, who says that the Indian fields at Wabquissit yielded forty bushels of corn to the acre.

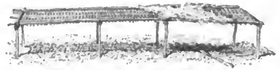
Fig. 5. Drying rack for grain (rice).

The Indians taught the colonists their native agriculture—"to cull out the finest seede, to observe the fittest season, to keep distance for holes and fit measures for hills, to worme it, and weed it; to prune it and dress it as occasion shall require."

Wood states that the Indians surpassed the English husbandman in the care of their fields, keeping them clear with their clam-shell hoes, not suffering a weed to "advance his audacious head above their infant corn, or an undermining worm to spoil his spurnes."

When a field was to be broken up, they had a "loving, sociable, speedy way to dispatch it. All the neighbors men and women, fortie, fiftie, &c., joine and came in to helpe freely." In preparing new land, the trees were cut off about three feet from the ground and the branches piled against the trunk and burned. Corn was planted between the stumps and in the course of time the stumps and roots were torn up.

Every family had its garden, which was usually near the summer cabin, although sometimes a family had gardens a mile or two apart or farther. When the work in one field was over, they would remove their cabin to the other. In many places along the coast from the Saco to Cape Malabar, Champlain saw well-kept gardens with their accompanying cabins. He describes Nauset Harbor as three or four leagues in circuit, entirely surrounded by little houses, around every one of which there was as much cultivated land as the occupant needed for his support.

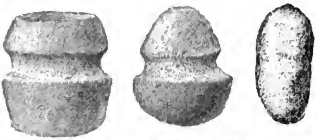

Fig. 6. Common forms of stone hammers.

Planting time arrived when the leaves of the white oak were as large as a mouse's ear. On land already cleared, the weeds were burned and the ground worked over with instruments of very hard wood shaped like a spade. The hills were three feet apart and in every one were placed three or four kernels of corn and as many beans. The earth was then heaped up with the shell of the horseshoe crab. Hoes of wood and clam-shell were also recorded, and Williams says that stone hoes were formerly used. The Stockbridge Indians employed for this purpose an implement made of the shoulder-blade of a bear, moose, or deer, fastened to a wooden handle. Sometimes, two or three herrings or other kinds of fish were placed in a hill as a fertilizer.

It was the women's work to plant and cultivate the gardens and gather the crops, "yet sometimes the man himself (either out of love for his Wife or care for his Children or being an old man) will assist." Great care was exercised to keep the ground free from weeds and to protect the young plants from the depredations of birds. Watch houses were erected for the latter purpose. Williams states that hawks were kept tame about the cabins to keep small birds from the fields and that, although the crows did the corn some injury, not one native in a hundred would kill one because of the tradition that in one of his ears the crow brought them their first grain of corn and in the other the bean from the field of the great god Kautantouwit.

The corn grown in the gardens of the New England Indians was of several varieties, the colors being red, blue, yellow, and white. The modern improved varieties do not radically differ from these earlier kinds. The bean was also of different colors and varieties. Josselyn writes, "they are variegated much, some being bigger a great deal than others. Some white, black, red, yellow, blew, and spotted."

Pumpkins and squashes were raised probably throughout New England. In nearly all of the old-fashioned fields in these states, these vegetables are grown in the same hill with the corn and it is probable that they were thus planted in the Indian gardens. Josselyn in his quaint book, "New England's Rarities," writes as follows concerning the squashes grown by the natives:

"The squashes, but more truly Squoutersquash, a kind of melon or rather gourds, for they often degenerate into gourds, some of them are green, some yellow, some longish like a gourd, others round like an apple, all of them pleasant food . . . but the yellow squash, because like an apple and about the bigness of a pome-water, is of the best kind."

The well-known modern improved varieties of this vegetable are the descendants of those found growing in the Indian gardens. The cultivation of the artichoke was adopted from the Indians by the colonists as far north as Canada. Its roots were used by the natives as an ingredient in stews. Champlain found it cultivated at Nauset Harbor in 1605 and at Gloucester in 1606.

Tobacco (*Nicotiana rustica*) was raised as far north in New England as the central Kennebec valley. It was a smaller and more hardy species than that now grown in warmer climates. This was commonly the only plant cultivated by the men.

The corn was harvested by the women and thoroughly dried on mats, care being taken to cover it at night with other mats and to uncover it when the sun was shining. When thoroughly dried, it was usually stored in caches, although it was sometimes placed in wooden receptacles about three feet high, made by cutting hollow logs into sections, or in baskets, and stored in the wigwam. Morton writes: "Their barns are holes made in the earth that will hold a hogshead of corne apeece in them. In these (when their corne is out of the huske and well dried) they will store in greate baskets which they make of Sparke [probably osier] with mats, under, about the sides, and on the top; and, putting it into the place made for it, they cover it with earth."

According to Wood, the holes were sometimes lined with bark. Champlain saw trenches in the sand on the slope of the hills some five or six feet deep. Putting their corn into large grass sacks, the Indians threw them into these trenches and covered them with sand three or four feet above the surface of the earth, to be taken out as needed.

The Pilgrims opened a cache at Cape Cod, being attracted by the heap of sand. In it they found "a little old basket filled with faire Indian corne and digged further and found a fine great new basket filled with very faire corn of this yeare, with some thirty-six goodly eares of corne, some yellow and some red, and others mixt with blue, which was a very goodly sight; the basket was round and narrow at the top, it held about three or four Bushels which was as much

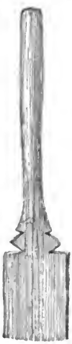

Fig. 7. Wooden shovel found in the Zuni Pueblo, Zuni river, Colorado. It is not known whether this was used for agricultural purposes only.

as two of us could lift from the ground and was very handsomely and cunningly made."

Southeastern Indians.

Every Indian town or community in that part of the country now known as Georgia assigned a parcel of land for agricultural purposes, and in this parcel every family had its lot, bounded by a strip of grass, by poles, or some artificial mark. When the planting season arrived, all able-bodied inhabitants prepared the ground, planted the seed and afterward, at proper times, cultivated the growing plants. These labors were superintended by an overseer who was elected annually. He awakened the inhabitants at daybreak with a loud cry, assembled the men with their implements in the public square, and by sunrise led them into the fields. The women followed later in detached parties, bearing provisions.

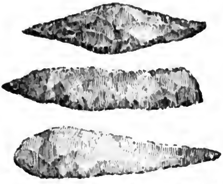

Fig. 8. Stone knives used in harvesting and other agricultural operations.

Among the Creeks, the corn harvest was preceded by a festival lasting from four to eight days with many ceremonies and much rejoicing. After this, the people assembled for the harvest, and every man carried to his own granary the corn derived from the lot assigned to him in the general plantation, except that he contributed according to his ability or inclination to the king's granary, which was a public treasury to which every citizen had the right of free and equal access when his own private stores were consumed. It served also as a surplus to accommodate travelers, to assist neighboring towns whose crops had failed, to afford provisions for hostile expeditions, and for other exigencies of the state.

Besides the general plantation, every family of the village inclosed a garden spot adjoining its cabin wherein were cultivated corn and vegetables for subsistence until the general harvest. Widows with large families were assisted in planting, working, and gathering their crops.

Three varieties of corn in northern Georgia are thus described: The first was small, maturing in two months, and was called by the English "six weeks' corn;" the second was yellow and flinty and was known among the natives as "hommony" corn; while the third, which was largest and yielded a white soft grain, was called "bread corn."

The granaries, or food storehouses, among the Florida Indians were built of stone and earth and covered with palmetto leaves and clay in places where protection was afforded against the direct rays of the sun. Such storehouses served as depositories not only for corn, fruit, nuts and roots, but also for dried fish, alligators, dogs, and deer, and other jerked meats. Such hoards of corn, meat, and fruit are frequently mentioned in early narratives of those who traveled through the southeastern part of the United States.

There was at least one tribe of Indians that did not practice agriculture. This tribe was known as the Ais and occupied the eastern coast of Florida. They subsisted entirely on fish and wild fruits.

Omaha Indians.

Among the Omaha Indians, who were a group of the Siouan family, corn and buffalo meat were of great importance and were celebrated in sacred songs. Corn was regarded as a "mother" and the buffalo as a "grandfather." At the corn harvest, one of the keepers of the sacred tents selected a number of ears of red corn and laid them away for the next planting season. Only perfect ears were selected. In the spring, when the grass appeared, a tribal assembly was held for feasting and consultation concerning the planting time. The time having been determined, a crier was sent through the village. As he proceeded, he cried out, "They do indeed say that you will dig the ground! Halloo!" He carried the sacred corn, that had been shelled, and to every household he gave two or three grains. These were mixed with the ordinary seed corn of that household. After this, it was lawful for the people to plant corn.

The following varieties of corn were found among the Omahas: A white corn of two sorts, one hard and the other soft; a blue corn, one hard and translucent and the other soft; a yellow corn, same as the blue; a spotted corn, two sorts, and a soft corn, one covered with gray spots and the other with red spots; a reddish blue corn; a very red corn; a figured corn on which were yellow and red lines, as if painted; a corn of three sorts, which were the sweet corn of the white people, one sort being translucent, but not very white, another sort soft and yellow, and a third soft and blue. All of the foregoing varieties matured in August. Besides these, there was an early variety that first ripened in July.

These Indians cultivated three kinds of pumpkins. One kind was generally greenish and round, but slightly flattened on the side, like a turnip. It was usually cut into circular slices, which were hung together in festoons and dried. Another variety was large, white, and striped, but not good for drying. The third variety was not dried. Some of these pumpkins were white and others a sort of black or dark blue, and small. Others were spotted and were eaten before they became too ripe. Sometimes, the raw pumpkins were baked on coals; they were frequently steamed after they had been cut into slices and placed in a kettle with a small quantity of water.

Red haws were occasionally eaten raw by the

Omahas. Buffalo berries were eaten raw or were dried and boiled before eating. Plums, though dried by the Dacotahs, were never dried by the Omahas, but eaten raw. There were two kinds of chokecherries that were harvested by the Omahas. These were crushed by being pounded between two stones and were then dried. The hackberries eaten by the Indians were as large as small cherries and were sweet and black. Raspberries were dried and boiled. Strawberries were not dried, but were eaten raw. One kind of wild grapes, the fox, was eaten raw or dried and boiled.

Among the nuts gathered by the Omahas in the autumn was the "búde," or acorn of the red oak. They were boiled until the water was nearly boiled away. This was poured out and fresh water and wood ashes put in. The nuts were then boiled until they became black. The water and ashes were then thrown away, fresh water was put into the kettle, and the nuts were washed until they were clean. At this point they were found to be cooked till ready to fall to pieces. They were then mixed with wild honey and were ready for eating. They were capable of satisfying hunger to the utmost, only a handful being necessary to accomplish that end.

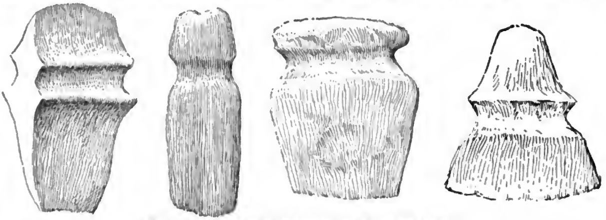

Fig. 9. Kinds of ax-heads employed by North American Indians.

The Omahas preserved fruits in wild honey. The only sugars or sirups that they had were manufactured from the sugar maple and box-elder. Hazel nuts and black walnuts were never boiled nor dried, but were eaten raw. The Omahas knew nothing about pulse, mesquite, and screw beans, nor did they eat the seeds of grasses and weeds.

The Indian turnip was dried by the Omahas, after throwing away the skins and hard interior. The fresh pieces were placed in a mortar and pounded, after which they were dried and frequently mixed with grease. Occasionally, the green bulbs were boiled with dried meat without being pounded.

The Omahas had a native potato which was dug in the winter by the women. It was found in different varieties and some of these on a common root. These potatoes were boiled and then dried, after the skins had been peeled off. There was found, also, an aquatic plant resembling the waterlily, being a kind of wild rice. The seeds were prepared as food by being roasted under hot ashes. Another kind of wild rice was translucent and was the principal article of diet for those Indians who resided in very cold regions north of the Ponkas. Calamus root was eaten after boiling.

Many varieties of beans were planted and eaten by the Omaha Indians, these being superficially described as beans with black spots, with white spots, with yellow spots, with red spots, with gray spots, with very red spots, with very black spots, a dark red variety, a white variety, a dark blue variety, a dark orange-red variety, a white variety with red on the part that is united to the vine, a white variety with black on the part that is united to the vine, a blue variety with white spots, and a sort of grayish yellow variety.

The seeds and roots of the *Nelumbo lutea*, an aquatic plant, were eaten by the Omahas. When the ice was firm or the water shallow, the Indians gathered the seed, which they parched, beat open and ate. The roots were cut into pieces about six inches long and dried; if to be eaten fresh, they were boiled.

Peppers, aromatic herbs, spices, and other savors were not known to the Omahas. The only drinks known to them were soups and water. Teas, beer, wine, and other fermented juices and distilled liquors were unknown.

A narcotic plant in use before the coming of the white race was the native tobacco plant, which differed from the tobacco plant of the Atlantic coast. Its leaves were bluish and were about as small as a man's hand, with the tobacco-leaf shape. Other Indian tribes, among them the Rees, used a native tobacco.

The inner bark of the "red willow," or arrowwood (Dogwood, *Cornus sericea*), or of wild-rose bushes, or, when these could not be obtained, sumac leaves, were mixed with tobacco, and the two ingredients were well dried over a fire and rubbed between the hands. This was killickinnick, for smoking in pipes.

Southwestern Indians.

Irrigation.—It was once assumed that the Indians of Arizona and throughout the Southwest received the idea of irrigation from Spanish missionaries, but it is now known that such was not the fact.

Agriculture was conducted in prehistoric times with the aid of extensive reservoirs and dams. The most important of this work was in the valley of the Gila and its tributaries, in southern Arizona, where scores of miles of ancient ditches are still traceable, in instances extending more than ten miles from the stream from which the water was diverted. According to some observers, there are individual canals each of which traverses a total distance of twenty-five miles. In the Salt river valley alone it is estimated that from 200,000 to 250,000 acres were made available for cultivation by means of irrigation before the arrival of white men. We may now give some of the particulars of the Southwestern Indians.

Some of the ancient canals were about seven feet deep and four feet wide at the bottom, but the sides sloped gradually, rising in steps, and giving the acequia a width of about thirty feet at the surface. Both the bed and the sides were carefully tamped and plastered with clay to prevent waste from seepage. Remains of what are believed to be wooden head-gates have been exposed by excavation.

Even when the water-supply of a Pueblo settlement situated several miles from a stream was obtained by canals, every house cluster was provided with a reservoir. In many instances throughout the Southwest, reservoirs, sometimes covering an area measuring one mile by half a mile, designed for the storage of rain-water, were the sole means of water-supply, both for domestic purposes and for irrigation. In the valley of the Rio Grande and its tributaries, and in New Mexico, small reservoirs were the chief means of supplying water to the ancient villages.

The pueblo of Kinbineola in New Mexico exhibits one of the best examples of ancient irrigation works constructed by the southwestern Indians. The water was diverted from the stream to a large natural depression and thence conducted to the fields two miles away by a ditch around a mesa and along a series of sand hills on a fairly uniform grade. This ditch was mainly earthwork, but, where necessary, the lower border was reinforced with retaining walls of stone.

In Arizona, several of the old canal beds have been utilized for miles by modern ditch builders; in one instance a saving of $20,000 to $25,000 was effected at the Mormon settlement of Mesa in Maricopa county, by employing an ancient acequia that traversed a volcanic knoll for three miles and which at one point was excavated to a depth of twenty to twenty-five feet in the rock for several hundred feet. The remains of ditches the building of which necessitated overcoming similar, though less serious, obstacles, exist in the valley of the Rio Verde; and on the Hassayampa, northwest of Phoenix, a canal from that stream traverses a lava mesa for several miles and falls abruptly into a valley forty or fifty feet below.

Hand-irrigation was, and still is, practiced by the Pueblo Indians. As in former times, Zuni women, in order to raise their small crops of onions, chile, and the like, are obliged to carry water in jars on their heads, sometimes for several hundred yards. It is then poured on the young plants with a gourd ladle. At the Middle Mesa villages of the Hopi, garden patches are watered in much the same way, except that here the gardens are within easier reach of the springs and are irrigated by means of a great vessel fastened to the end of a long pole.

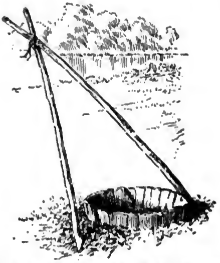

Fig. 10. Stave-lined thrashing-hole for treading out grain (rice).

The Hopi.—The agriculture of the Hopi Indians (popularly known as Moqui) remains substantially as it was hundreds of years ago. Corn is their principal food and this is raised on a few thousand acres. One-third of the annual crop is now preserved in the event of a future failure through drought or other causes. Cotton is now raised in small quantities, but in early times the native cotton was extensively grown. In years of stress, desert plants, which have always been utilized to some extent for food, form an important part of the diet.

Both the Hopi of today and the ancient inhabitants of the vicinity of the present Solomonville on the Gila constructed reservoirs on the mesa sides from which terraced gardens below were readily irrigated, the reservoirs being supplied by impounding storm water.

Throughout the Southwest where pueblos occupy the summits of mesas, reservoirs were provided; according to tradition, some of these were filled in winter by rolling into them immense snowballs. For hundreds of years the pueblo of Acoma has derived its entire water-supply for domestic purposes from a natural depression in the rock which receives the rainfall from the mesa summit.

The Mohave Indians hunted but little before the advent of the whites, their chief reliance for food being on cultivated products, as corn, pumpkins, and beans, to which they added mesquite beans, screw beans, piñon nuts, and fish to a limited extent. They did not practice irrigation, but relied on the inundation of the bottom lands to supply the needed moisture; hence, when there was no overflow, their crops failed. Articles of skin and bone were very little used, and materials such as the inner bark of the willow, vegetable fiber, and the like, took their place. The baskets which were in common use were obtained from other tribes.

The Havasupai in Arizona subsisted in summer chiefly on corn and sunflower seed, which they cultivated by means of irrigation, and also on the wild datila and mescal. In winter they depended on game, which they hunted in the surrounding uplands and mountains.

The Apaches.—Being a nomadic people, the Apaches practiced agriculture only to a very limited extent before their permanent establishment on reservations. They subsisted chiefly on the products of the chase and on roots (especially that of the maguey) and berries. They had few arts, but the women attained high skill in making baskets. Their dwellings were merely shelters of brush.

Cotton was raised to a considerable extent by the Pueblos, especially the Hopi, from time immemorial, and cloth, cord, thread, and seed are commonly found in ancient deposits in caves, cliff dwellings, and ruined pueblos throughout New Mexico and Arizona.

Gourds.—The shells of gourds were employed by the Indians of the Southwest for storage and carrying, as water-jugs, dippers, spoons, and dishes, and for mixing-bowls, pottery smoothers, rattles, sounders for the rasping stick, roof-drains, masks, parts of ornaments, and other purposes; and the flowers were used as food, clothing material, and in ceremonies. Various species and varieties were commonly raised, producing fruits of different shapes and sizes—globose, lenticular, cuneiform, tubular, with necks of varying lengths and curves, or without necks, but all of value for the general or special purpose for which they were selectively grown. Gourds were sometimes shaped by pressure or bandaging while growing. Wild species were used as medicine. They were rarely made into utensils, while the larger and varied gourds which were early derived, like corn, from regions on the South, adapted themselves more fully to Indian needs.

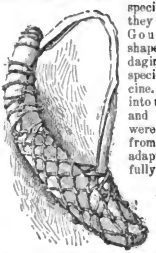
Fig. 11. Type of carrying gourd used by the Pima Indians, Colorado river, Arizona.

Pacific coast Indians.

No plant was cultivated by the Indians of the Pacific coast at the time of the advent of the whites; but they utilized a very large number of wild plants. The Miwok division of the Moquelumnan family in California gathered acorns in large quantities and stored them for winter use in granaries raised above the ground. Game, in which the country abounded, and roots of various kinds constituted the chief food-supply of the Kalapooian family. The degree in which some tribes of the Pacific coast Indians utilized plants was almost exhaustive, as is proved by the list for the Mendocino county Indians.

Camas.—The bulbs of the camas were a staple food of several coast tribes of the Pacific Northwest of the United States and were prepared for food by prolonged steaming. Pinole was made from some kinds of wild seeds which were parched and pulverized, the meal being eaten after it had been cooked. In some parts of California, clover was eaten in early spring, pinole in late summer, and acorns in winter.

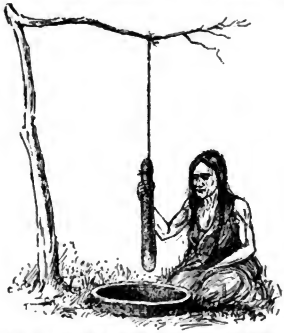
Fig. 12. The probable method of using the stone pestle.

Acorns.—When the acorns were ripe, the men went out and beat them off the tree or broke off small branches and threw them to the ground. The squaws collected them in a large conical carrying-basket. At home, the nuts were spread out in the sun until thoroughly dried, when they were sometimes cracked, either with the teeth or by means of a small stone, and still further dried for future use, or were stored away in the house with the shells on. When ready for use, the kernels, dried and rather brittle, were pulverized in a mortar. The resulting meal was astringent and bitter on account of the tannin and the bitter principle which acorns contain, both substances being deleterious to health and interfering with digestion. These were removed by mixing the meal with water in a shallow depression in sand or other porous material and allowing the water to percolate through the mass until the bitter taste had disappeared, the time required being perhaps two hours.

Clover.—Among the Mendocino county Indians, it was no uncommon sight from the beginning of April to July to see small groups of Indians wallowing in the clover and eating it by handfuls, or to see the Indian women emerging from a patch of clover and carrying the stems to their homes.

Cider was made from manzanita berries by the Concow women. The seeds were scalded for a few minutes to make them soft and then crushed by mashing; to a quart of this pulp an equal quantity of water was added and the mass was immediately poured upon some dry pine-needles in a shallow sieve-basket and the water allowed to drain into a water-tight basket beneath; or it was sometimes allowed to stand an hour or so before straining. After cooling, the cider was ready for use, having a delightfully spicy and acid taste.

Canadian Indians.

The cultivation of plants by Indians in Canada was confined almost entirely to the region east of Lake Huron and extending to the Atlantic ocean. There they raised corn, beans, artichokes, pumpkins and squashes. But everywhere in the zone producing wild plants with edible parts, the Indians subsisted more or less upon them, in conjunction with meat and fish.

The earliest extended notice of maple-sugar is "An account of a sort of Sugar made of the Juice of the Maple in Canada," published in the Philosophical Transactions of the Royal Society, for 1684–5, where it is stated that "the savages have practiced this art longer than any now living among them can remember." The Indian origin of maple-sugar is conclusively indicated by various explorers.

Agricultural implements. (Figs. 1–14.)

Many varieties of agricultural implements were used by the Indians: Digging sticks, hardened in fire and sharpened and often weighted; dibbles, hoes, harvesting devices, corn-husking pegs; for harvesting both wild and cultivated products, various tribes had tongs for picking the cactus fruit, stone implements for opening hulls or shells, baskets for carrying and storing, poles for reaching fruit, harvesting apparatus for grass seed, wild rice, camas, coonti, corn, and the like.

In the early statements, the implements used in cultivating the ground are described as "wooden howes" and "spades made of hardwood." "Florida Indians dug their ground with an instrument of wood flattened like a broad mattock;" "used the shoulder-blade of a deer or a tortoise shell, sharpened upon a stone and fastened to a stick;" "a piece of wood three inches broad, bent at one end and fastened to a long handle, sufficed them to free the land from weeds and to turn it up a little." Mention is also made of shells used as digging implements.

Certain numerous large blade-like chipped implements of flint have been found in the rich alluvial bottom lands of the middle Mississippi valley, whose polished surface in many cases indicates long-continued use in digging operations; and this, in connection with their suggestive shape, has caused them to be classified as hoes and spades. Extensive quarries of the flint nodules from which implements of this class were shaped have been found in Union county, Illinois. Great numbers of the hoes and spades originating in these or similar quarries are distributed over an extensive area in Missouri, Illinois, and neighboring states. The larger implements of this class, often reaching a foot in length, are generally called spades. Many stone hoes of various shapes have been found in southeastern United States and in other regions.

Among the more sedentary and agricultural tribes, where the procuring of food did not necessitate hostile collision with other tribes, the men usually did their fair share of the home work, laboring in the field together with the women.

Fertilizers.

Although it has been stated that the Indians did not use fertilizers, there are evidences that they did. The Plymouth colonists were told by the Indians to add fish to the old grounds, and it is stated that the Iroquois manured their land. Lescarbot says that the "Virginia Indians and others enriched their fields with shells and fish."

Conclusion.

The foregoing matter shows how erroneous the once prevalent opinion was that the Indians north of Mexico, previous to their discovery by the white race, were nomads, subsisting mostly on game and fish and practicing agriculture to a very limited extent, if at all. On the contrary, the old records, in speaking of the temperate regions, almost without exception notice the fact that the Indians, from the eastern border of the western plains to the Atlantic ocean, were generally found dwelling in settled villages and cultivating the soil. De Soto found all the tribes that he visited, from Florida to the western part of Arkansas, cultivating corn and other food-plants. The early settlers found the same fact along the Atlantic coast from Florida to Canada. In the northern half of the Mississippi valley east of the great plains, Indian agriculture was nearly everywhere observed; and it was carried on under irrigation in the Southwest under a coöperative or communal system of water control and apportionment of use.

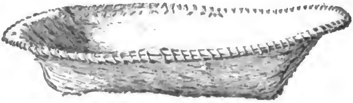

Fig. 13. Birch-bark winnowing basket used by the Indians of northern Wisconsin and Minnesota.

The New England cornfield of the latter-day white man, with the corn planted on a fertilizer in plowed and harrowed land, several kernels in a place, in rows four feet apart and with the planted places three feet apart in the row, with beans and pumpkin seeds planted in the corn rows, with the hilling of the clusters of corn-stalks, with a cultivation performed for the purpose of suppressing weeds and grass, with a large reliance upon the hoe, and with scarecrows to frighten away the crows—this is still an Indian cornfield; and the white farmer still uses the Indian's husking-peg and stores the corn in the southern Indian's crib set upon posts and with open construction so as to admit the air to prevent the molding of the corn.

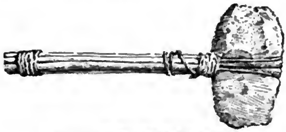

Fig. 14. Common form of flint hatchet.

The Indians of North America, north of Mexico, did these things in regions more or less extensive when the whites came:

(1) They reproduced wild plants under control.

(2) They propagated cultivated varieties of wild plants.

(3) They practiced plant-breeding by seed selection.

(4) They planted seeds, or hills of seeds, far enough apart to admit light to plants, permit cultivation, and secure soil nourishment greater than that of wild conditions.

(5) They used crop fertilizers.

(6) They broke and pulverized the surface of the ground with the effect of making plant-food more available and of conserving moisture (although not understanding the nature of the operation).

(7) They knew that the repression of weeds and grass was important to the growing crop.

(8) They practiced multiple cropping (corn, beans, sunflowers, pumpkins, and the like), at the same time.

(9) They cleared away the forests by girdling and fire.

(10) They invented the corn-crib adopted by the white farmer and dried corn by air-circulation.

(11) They discovered the narcotic effect of tobacco smoke.

(12) They cured tobacco by artificial heat.

(13) They made sirup and sugar by evaporating tree sap.

(14) They preserved fruits and berries with sirup, sugar and honey.

(15) They preserved meats by drying and smoking.

(16) They preserved fruits, berries, vegetables, and meats by sun- and air-drying.

(17) They protected vegetables and other products from rotting bacteria and fungi by burying them in the ground.

(18) They extracted oil from nuts by boiling them in water.

(19) They extracted paints, dyes, and stains from plants.

(20) They utilized vegetable fibers by spinning and weaving.

(21) They greatly increased the utility of various food-plants by cooking and by combining them in the process; also by milling and by other preparations preliminary to cooking.

(22) They gave to the whites the priceless legacy of Indian corn, of which they raised not less than 1,000,000 bushels in the ear yearly, and perhaps several millions.

(23) They contributed other cultivated plants, —sweet corn, popcorn, tobacco, beans (not all kinds), pumpkins and squashes (summer and winter).

(24) They cultivated the cotton plant and spun and wove its fiber for so long a time that the date at which they began is not known.

(25) They practiced irrigation on an extensive scale.

(26) They habitually performed varieties of agricultural undertakings coöperatively.

(27) They kept fresh meat in cold storage or refrigeration (in snow).

(28) They developed agriculture to such a degree in large regions that their subsistence was chiefly derived from cultivated plants. They were the original farmers of the United States and Canada.

Literature.

The foregoing article derived its material from written accounts of early observers collected and critically treated by recent and present ethnologists, and from observations during the last half century among Indians who had preserved aboriginal customs, chiefly from writings of these authors: A. F. Chamberlain, V. K. Chesnut, F. V. Coville, J. O. Dorsey, J. W. Fewkes, H. W. Henshaw, J. N. B. Hewitt, F. W. Hodge, W. H. Holmes, Walter Hough, A. Hrdlicka, A. L. Kroeber, Otis T. Mason, Edward Palmer, W. E. Safford, Cyrus Thomas, Charles C. Willoughby; and the following reports: Bureau of American Ethnology: Handbook of American Indians, and Annual Report No. III; Jones' Antiquities of the Southern Indians; United States Department of Agriculture: Contributions from the United States National Herbarium, Vols. V, VII; American Anthropologist.

Little comprehensive work had been done on this subject before the publication of the Handbook of American Indians north of Mexico, the first volume of which was issued by the Bureau of American Ethnology of the Smithsonian Institution in 1907. In the form of short articles, chapters, and various references to Indian agriculture, beginning with the writings of the early explorers, the literature of this subject is multitudinous, but much of it should be accepted only after critical treatment and approval. Unless extended research is desired, the following references provide sufficient information for a good understanding of the subject: Bureau of American Ethnology, Handbook of American Indians north of Mexico; F. V. Coville, Notes on the Plants used by the Klamath Indians of Oregon; Contributions from the United States National Herbarium, Vol. V, p. 87; V. K. Chesnut, Plants used by the Indians of Mendocino county, Cal.; Contributions from the United States National Herbarium, Vol. VII, p. 295; Edward Palmer, Food Products of the North American Indians, Report

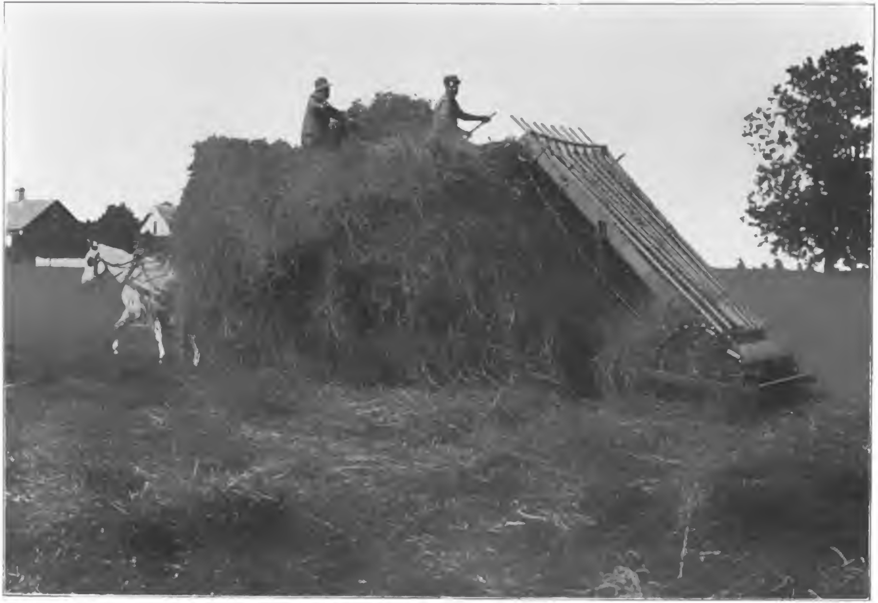

Plate III. Present-day hay-handling methods. A farm scene in Indiana

of the Commissioner of Agriculture, 1870, p. 404; Edward Palmer, Plants used by the Indians of the United States, American Journal of Pharmacy, Vol. L, p. 539; Charles C. Jones, Jr., Antiquities of the Southern Indians, 1873, two volumes; Charles C. Willoughby, The Virginia Indians in the Seventeenth Century, American Anthropologist, Vol. IX. No. 1; Charles C. Willoughby, Gardens of the New England Indians, American Anthropologist, Vol. VIII, No. 1; J. O. Dorsey, Omaha Sociology, Annual Report of the Bureau of American Ethnology, No. 3, p. 302; Washington Matthews, Ethnography and Philology of the Hidatsa Indians, Geological Survey, 1877.

HISTORICAL SKETCH OF AMERICAN AGRICULTURE

By *T. N. Carver*

The agricultural history of the United States divides itself naturally into five main periods. The first is coextensive with the colonial period of our political history, and includes the years from 1607 to 1783. The agriculture of this period is characterized by comparatively few technical improvements. Its natural development was more or less interfered with by the policy of the mother country. The clearing of the forests, the breaking of the soil and reducing it to cultivation, experimenting with new crops and selecting those best adapted to the conditions,—these were the principal forms of agricultural enterprise of this period. Agriculture was in the main self-sufficing, the farmers and their families deriving their subsistence mainly from their farms and selling only the incidental surplus for cash, or bartering it for merchandise. The chief exceptions were wheat in the middle colonies, tobacco in all the southern colonies, and rice and indigo in the Carolinas and Georgia, these products having been exported in considerable quantities.

The second period, which extended from 1783 to 1830, is characterized by the rapid expansion westward into the great interior valley, the beginning of the public land policy of the federal government, the rise of cotton to the position of predominance in the South and the consequent development of slavery as a characteristic southern institution, and by the first beginnings of the application of of science to agriculture; though the industry remained in the self-sufficing stage, in the main, except in the cotton region of the South.

The third period includes the years from 1830 to 1860, and is characterized by the almost complete transformation of the agricultural industry. At the beginning of this period, as already stated, the industry was generally in the self-sufficing stage; but at its close, it had passed almost entirely into the commercial stage, that is, the stage in which products are grown primarily for the market, and only incidentally to be consumed by the farmer and his family. It was during this period that most of the epoch-making inventions in agricultural machinery were brought into use, the twine-binder being the most conspicuous exception. It was during this period also that railway transportation opened up the great interior, and the newly developing prairie states began pouring through these channels the floods of farm produce that were to disturb the economic equilibrium of the entire world. It was during this period also that systematic and sustained efforts were first made to improve the breeds of live-stock, that agricultural societies were widely organized, and that agricultural fairs became established institutions. The result of all these new agencies was not only a rapid expansion of American agricultural enterprise, but a complete transformation in the character of the industry itself.

The fourth period extends from 1860 to 1887. Agriculture, having already passed definitely into the commercial stage, was ready to respond to the new opportunities that were created for it during this period. The result was such an expansion of agricultural enterprise as the world had never seen before and may never see again. The chief factors in stimulating this remarkable growth were the Homestead Acts of 1862 and 1864, the disbanding of the armies of the Civil war, the invention of the twine-binder and the roller process of manufacturing flour, the building of the transcontinental railroads, the permeation of the entire Mississippi valley by the so-called "Granger" roads, and the development of the immense cattle ranches of the far West. During this period, also, the cotton industry underwent a complete transformation owing to the abolition of slavery.

The fifth period began about 1887, and is not yet completed. It may be called the period of the reorganization of American agriculture. It is characterized by the practical exhaustion of the public lands,—at least of that portion which could be cultivated and made to yield immediate returns without the expenditure of considerable amounts of capital,—the consequent resort to more intensive methods of cultivation on lands in the eastern and central sections, the rapid rise in the value of these lands, the development of irrigation and drainage schemes under state and federal control, the reawakening of interest in agricultural education, and the renewal of the activities and the expansion of the functions of the national and state departments of agriculture, and of the experiment stations connected with them.

I. The Colonial Period, 1607–1783

When white men first began to practice the arts of agriculture on American soil they were not thrown absolutely on their own resources and power of invention. They found already in existence a system of agriculture crude and inefficient as compared with that which they had left behind them in the old world, but containing possibilities of development which they were able to turn to their own advantage and profit. Few of us today understand how much American agriculture owes to the Indian. We are disposed to dwell on the rudeness of his methods rather than on the service that he rendered. [For fuller details of Indian agriculture, the reader is referred to the article on that subject by G. K. Holmes.]

Indian agriculture.—So inefficient were the methods of the natives that, according to the best authorities, no more than 150,000 of them were ever able to make a living, and that a poor one, on the soil of that vast territory which lies east of the Mississippi river within the present boundaries of the United States. That their white successors, though building upon the agriculture of the Indians as a foundation, have built exceedingly well, is shown by the fact that this same region now supports a population of more than 60,000,000, that is more than 400 times as many people.

Crude and inefficient as was their system of cultivation, the Indians taught the European colonists how to grow two crops which contributed powerfully to the growth and prosperity of the colonies, and of the whole country since the colonial period. These two crops are maize, or Indian corn, and tobacco. The potato is also a native of the American continent, but it is doubted whether it was grown anywhere within the present boundaries of the United States prior to the establishment of European settlements.

Indian corn, or corn, as it is universally called in the United States, deserves, for several reasons, to be called the typical American product. It is not only a native product, unknown in Europe before the discovery of America, but it is still the leading American crop,—its annual value exceeding that of any two other crops combined. Moreover, it is the largest single American product of any kind—agricultural, mineral, or manufactured. In addition to all this, it is the only important product, aside from cotton, of which the United States produces more than all the rest of the world combined. There is, therefore, no other product which deserves, on so many counts, to stand as the American product.

Tobacco is, at the present time, a crop of vastly less importance than corn; but, during the colonial period of our history, it was the chief money crop of the southern colonies, and contributed more to their prosperity than any other single product. Both these crops were not only native to the soil of North America, but their cultivation was taught to the colonists by the Indians.

Indian methods of cultivation.—Bruce, in his "Economic History of Virginia," states that "in the course of the winter following the settlement of Jamestown, the colonists lived in a state of great abundance on fish and game, maize bread, peas and pumpkins, only a small part of which had been obtained by their own industry." These plentiful supplies had been obtained by purchases from the Indians. There had been attempts to produce English wheat during the years 1607 and 1608, but without great success, the seed or the method of cultivation not being suited to the rich loam and the virgin soil of the region.

In 1609, under the management of Captain John Smith, the first successful attempt by Englishmen to grow Indian corn was undertaken. Corn was much better adapted to the soil than wheat, and they had, besides, the successful practice of the Indians as an example. But they were not dependent upon example alone. Two Indian prisoners having fallen into their hands, Captain Smith determined "to make use of their knowledge of the proper manner of cultivating maize." He ordered that forty acres should be broken up and that the native grain should be planted in strict conformity to the Indian rule. This was done under the immediate superintendence of the Indian prisoners, who thus became the direct instructors of their conquerors in the production of this great American crop.

Except for the development of superior tools and labor-saving appliances, the white men have not yet materially improved upon that first lesson. The ground was broken and the crop cultivated entirely by hand, the spade, and possibly the hoe, being the only tools in use. In this they had the advantage over the Indians, who, not having metals, used only implements made of stone, bone and wood. Their principal agricultural implement was a rude hoe made by tying the shoulder blade of a moose, bear or deer to a stick, with rawhide thongs. The seed was planted, after the true Indian fashion, in hills four feet apart each way, from four to six grains being planted in every hill, and covered with three or four inches of loose soil. During the growing season the weeds were kept down and the soil kept loose by hoeing. When the corn was tall enough to shade the ground and flourish in spite of weeds, it was hilled up—a method still practiced by corn-growers.

The Plymouth colonists were taught substantially the same method by their Indian neighbors, the most important difference being that, in the poorer soil of New England, the Indians usually placed one or two fish or horse-shoe crabs in every hill of corn. The Indians regularly consumed a part of their crop by roasting the ears. The part that was allowed to ripen was harvested, dried in the sun or over fires, and then stored in holes dug in the ground, lined with bark, and covered over to keep out the water. These stores were hidden from their lazy husbands by the women, who grew the crops. It is said that at one time the colonists found one of these Indian storehouses just as they were on the verge of starvation.

The Indians had also large wicker baskets in their wigwams in which they kept a store of corn for immediate consumption. Like the Virginia Indians, they used only the rudest implements and cultivated their crops entirely by hand. When they first saw a plow at work they informed the plowman that if he was not the devil he must be very much like him.

Unfortunately, very little is known regarding the Indian method of cultivating tobacco, beyond the fact that the work was usually done by the men instead of the women. This seems to have been the only industry, besides hunting, in which the men took the principal part. It is probable, however, that, as in the case of corn, the methods first adopted by the colonists were borrowed from the Indians; but this is not certain.

Agriculture in the Virginia colony.

Besides being the first permanent English colony within the present boundaries of the United States, Virginia deserves first place because it was the most purely agricultural of any of the early colonies. In any agricultural history the first question is that of the relation of the farmer to the land. In Virginia the title to the land was assumed to belong exclusively to the British crown, the Indians not being recognized as having any rights of ownership. There were many conscientious people in England who protested against this doctrine, but their protests did not affect the legal aspects of the question.

When the London Company was formed for the purpose of colonizing the vast area known as Virginia, it received from the crown a patent to the lands of the region, subject to certain obligations to the crown, with the privilege of making subgrants of title to private individuals. During the first year or two after the settlement at Jamestown, no provision was made for the private ownership of land, or for its cultivation under private management. It was found, however, that the system adopted was entirely unsuited to the conditions, and the colony did not begin to flourish until the principle of private ownership was recognized. The private ownership of land, in fee simple, became the characteristic system of land tenure in the Virginia colony and has remained ever since the characteristic American system.

Methods of acquiring titles to land.—There were three methods by which a private individual might acquire title to a tract of land: (1) By the purchase of a share of stock in the London Company, known as a "Bill of Adventure;" (2) by meritorious service; (3) by "Head Right."

A "Bill of Adventure" was merely a certificate entitling the purchaser to a share of the profits of the company, and also to a share of the land when the time came for dividing it. This time, it was supposed, would arrive in 1616. Each share or "Bill of Adventure" cost twelve pounds and ten shillings and entitled the holder to one hundred acres in the first subdivision and an additional one hundred acres in the second. Groups of individuals or companies could, by purchasing many shares, acquire the same rights over large tracts as private individuals could over smaller tracts. Some immense tracts were thus acquired by companies who planted sub-colonies.

Ministers of the church, officers of justice and administration, physicians, and others who had commended themselves by useful and meritorious service were granted tracts of various sizes. Performers of manual service were also rewarded by grants of land. In the early years of the colony, that is, before 1624, every one who had been a servant or tenant of the company was, at the end of his stipulated term of service, placed on an equality with the holder of a share or "Bill of Adventure,"—that is, he was given a tract of one hundred acres. A second one hundred acres was usually added on condition that he would erect a house within three years.

By a "Head Right" was meant the right which every shareholder possessed of acquiring a title to fifty acres of land for every person, bond or free, whom he transported to the colony at his own expense, provided the person so transported remained in the colony for a period of three years.

Beginning with 1618, this method became more and more important every year until it finally became the principal and most common method of acquiring title to land. The right was soon extended to settlers who were not shareholders. It was so laxly administered that many abuses of the system arose. Finally, so lax was the administration that patents were issued to any one who would pay a fee to the secretary of the colony.

At first the tracts patented were small. In 1626 the majority of all the holdings in the colony ran from 100 to 150 acres each. Ten years later the size had greatly increased[1]:

Patents issued in 1636 averaged 351 acres.
Patents issued in 1638 averaged 423 acres.
Patents issued in 1642 averaged 559 acres.
Patents issued in 1650 averaged 677 acres.
Patents issued from 1650–1655 averaged 591 acres.
Patents issued from 1655–1666 averaged 671 acres.
Patents issued from 1666–1679 averaged 890 acres.
Patents issued from 1679–1689 averaged 607 acres.
Patents issued from 1695–1700 averaged 683 acres.

When the surveyor received a certificate of head right he proceeded to make a survey of any unappropriated tract that the patentee had selected. The latter almost invariably selected land adjacent to a river or the sea so long as any such land remained unappropriated. It was the practice of the surveyor to adopt the shore as a base and to measure off on this base a line whose length depended upon the size of the tract to be patented. From either end of this base line, and at right angles to it, a line was run back to the distance of a mile. These two lines, together with the base and back lines, formed the boundaries of the tract to be patented. After all the land adjacent to the waterways was patented, the back line of these tracts was used as a new base for laying the back country off into tracts for new plantations.

There were many defects in these surveys, partly because of the crudeness of the system, partly because of the imperfection of the instruments, and partly because of the carelessness of the surveyors. Land was so abundant and cheap that a few rods more or less was not thought to be a matter of much consequence. Later, however, these defects gave rise to endless litigation, to the enrichment of the lawyers and to the building up of an able and influential legal profession.

After the survey was made and the patent issued, two steps were necessary to perfect one's title to the land. The first was called "seating" or, as we should now say, making a settlement. It was necessary for the patentee to build a house and cultivate a crop upon the land. The second was the payment of a quit-rent of a shilling for every fifty acres, but this was not to go into operation until after seven years had elapsed. As a matter of fact, little attention was paid to this matter until the latter half of the seventeenth century, when the payment of quit-rents was insisted upon and caused considerable dissatisfaction. In reality they formed a kind of tax, for the revenue was generally devoted to the interests of the colony.

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[1] These figures are taken from Bruce's Economic History of Virginia, Vol. I, pp. 531, 532.

Laborers.—Besides the small proprietors who tilled their own land, there were two classes of laborers known as servants and slaves. The servants were men and women who bound themselves to work, during a stipulated period, without wages, except their subsistence, in return for their passage to the colony. Land being abundant and practically free, there were no hired laborers, in the modern sense of that term, because every free man could easily become a land owner.

As stated in the preceding section, it was customary to give the title to fifty acres of land to any one who could show that he had paid the passage money of a laborer, bond or free. It was simply a system of investing in labor and having a piece of land thrown in. Labor was expensive and land free. But since the servants themselves usually became land owners as soon as their term of service had expired, it became desirable, as the planters saw it, to have a more permanent supply of labor. This demand was met by the importation of negro slaves. The condition of the servants resembled in one respect that of the slaves. They could be sold for the remaining portion of their stipulated period of service.

While land was so abundant and labor in such great demand in the Virginia colony, England was relatively overpopulated. This was before any of the epoch-making improvements in agriculture and in manufacture which have since enabled England to maintain a population several times larger and in a much greater degree of comfort. Moreover, owing to a rise in the price of wool, some English estates were being converted into sheep runs and a number of agricultural laborers were being thrown into the towns. Naturally, therefore, Virginia was looked upon as a haven of refuge, and many who could not pay their own passage sold their labor for several years in advance in order to reach that haven.

There is no evidence that any considerable number of criminals were transported to Virginia, though there were undoubtedly some. But the criminal laws of that period were very severe, something like three hundred offences being punishable with death. It was not unnatural that a growing spirit of mercy should send some minor offenders to the colonies instead of to the gallows. A considerable number of political offenders were transported from England at the time of the civil wars between the king and parliament. They were all added to the number of indentured servants.

The coming to Jamestown of a cargo of negro slaves in 1619 in a Dutch ship, "Jeus," was the event that eclipses all others in importance in the early agricultural history,—and political history as well,—of Virginia and the South. This was the beginning of the system of slave labor which afterward became the dominant institution of southern economic and social life. The same scarcity of labor which we noted above in connection with indentured servants, together with the difficulty of keeping a body of free laborers in such close proximity to free land, conspired to make negro slavery welcome and to overcome whatever scruples may have been held against slavery in the abstract. The adaptability of these slaves to the cultivation of the great staple crops of the South soon enabled them to displace free labor, and to make it difficult for the small farmer to cultivate his own land in competition with plantations worked by slave labor. But the history of slavery in the United States has been written in letters of blood and fire and need not be repeated here.

Experiments in agriculture.—The early voyagers and colonists to Virginia usually came in the summer time and found the climate extremely warm as compared with English summers. This, together with the southern latitude,—Jamestown being about the same latitude as Algiers,—led the authorities in England to believe that the climate of Virginia was more nearly tropical than it really was. Accordingly a number of experiments in sub-tropical agriculture were tried in the early years of the Jamestown colony before it was discovered that the winters were quite as severe as those in England.

The fig, the orange, the olive and other southern fruits were introduced; French vine-dressers and wine-makers were sent out to instruct the colonists in grape-growing and wine-making. From the abundance of mulberry trees growing wild it was inferred that silk culture would prove profitable. The obvious scarcity of the essential factor to the success of that industry, viz., an abundant and cheap supply of skilled labor was overlooked.

Tobacco.—But after many such experiments it was soon discovered that tobacco was the most profitable crop. More and more, therefore, the colonists devoted themselves to the cultivation of that plant. The implements used were of the simplest description. The plows of that period were of wood except the share, which, owing to the high price of iron, cost more than the rest of the plow. In fact, during the early years of the colony, no plows of any description were used, the land being prepared and cultivated by hand. This was partly for lack of draft animals, partly because of the scarcity of iron for shares and ox-chains, but mainly because the system of culture made it next to impossible to use a plow advantageously.

It was the custom, especially in the growing of tobacco, to clear a piece of land by cutting down the trees and burning them, and to plant the crops among the stumps until the virgin soil was exhausted, and then to abandon it. The period during which a field was cultivated varied from three to eight years, according to the strength of the soil. Thus a field was ready to be abandoned by the time it was sufficiently free from stumps and roots to make it practicable to use a plow.

There was said to have been but one plow in the colony in 1618, and as late as 1649, when there were 15,000 white people and 300 slaves in the colony, there were only 150 plows. They were used mainly in preparing the ground for wheat and other small grain, which was cultivated to a small extent, and only on ground that had become too poor for tobacco or corn.

Bruce gives[1] an inventory of the tools furnished to every colonist with a family of six. "Five broad and five narrow hoes, three shovels, two spades, two hand bills, two broad and five felling axes, two hatchets, two steel saws, two hand saws and one whip saw, two hammers, two augers, two piercers, six chisels, three gimlets, two frows, two pick axes, one grindstone, and nails of many sizes." In harvesting wheat, the reap hook and the sickle were used all through the colonial period, the cradle being used for oats and barley in the latter part of the period.

The first agricultural experiment in the colony was the sowing of English wheat. This was begun within two weeks after the arrival of the first colonists at Jamestown, on land that had been cleared by felling timber for the fort. The next year additional ground was cleared for the express purpose of growing wheat. Though these first experiments were not very successful, from this time forward wheat continued to be grown in increasing quantities, though it always remained a minor crop. It was usually trodden out by horses and oxen instead of being threshed with a flail.

Corn.—Melons, squashes, potatoes, and various fruits were grown in considerable abundance; but corn was the chief reliance as a food product. During the early years of the colony, and as late as 1655, if not later, every householder was required to cultivate a certain amount, usually two acres, of corn. This was to prevent them from giving all their time to tobacco and leaving the colony dependent on outside sources for its food. Corn soon became so abundant, however, as to need an outside market. In 1631 and afterward, agents were sent to New England, Nova Scotia, the West Indies, and the Dutch settlements, to offer them corn at twenty-five shillings a barrel, delivered. Apples and pears were successfully grown by grafting English varieties on the stocks of the native crab. Peaches also were found to flourish, and every plantation had its peach orchard.

Live-stock.—Though ordinarily neglected, one of the most interesting phases of the agricultural development of Virginia and the South was the live-stock industry. It was early observed that animals, especially hogs and goats, multiplied very rapidly in the new country. Hogs were allowed to run at large and many of them reverted to a half wild state, living on the mast and roots which the forest supplied in such abundance. At last, they became more plentiful than deer. In spite, however, of their enormously rapid rate of multiplication, their numbers were kept down by the depredations of wolves and Indian marauders.

In 1631, a rule was adopted forbidding any one to kill a wild hog outside of his own plantation except as a reward for having killed a wolf. By the end of the seventeenth century, hogs had become so abundant that it was generally impossible to tell how many belonged to a given owner, as ownership could be traced only in the cases of those animals that the planter had been able to catch and brand. Shoats sold for four shillings apiece, and sows and barrows for eight shillings. There grew up a considerable export of pork, and Virginia hams and bacon came thus early to have a high reputation. In order to safeguard this reputation, laws were adopted prescribing the size of the barrels to be used, and public packers were appointed with instructions to reject all unsound meat. Justices of the peace were required to mark barrels sent out as a guarantee of size and quality.

There were probably a few cows in Virginia as early as 1609. In the summer of 1611, two shiploads of sixty and one hundred head each arrived. During the next few years there were numerous cargoes, a considerable cattle trade with Ireland having sprung up by 1621. In addition to the English and Irish breeds thus imported, cattle were brought from the West Indies also,— the descendants of the Spanish cattle brought by Columbus on his second voyage. By 1631 there were said to have been five thousand cattle in Virginia. Soon after this date oxen began to be exported to the Barbadoes to work on the sugar plantations. By 1640, when the number had increased still further, an export trade in cattle to New England began.

In the Virginia colony the cattle were allowed to run wild in the woods, finding their own forage except that they were sometimes allowed cornstalks and wheat-straw in the winter time. In order to keep them from wandering too far, fences were sometimes built enclosing considerable areas of territory, within which the cattle were allowed to wander at will. Cultivated fields had to be enclosed to keep the animals out. In 1632, the General Assembly declared that "every man should enclose his ground with sufficient fences and, in case of failure to do so, should suffer the consequence without legal remedy."[1]

Next to tobacco, the live-stock interest was thus demonstrably the predominant one in the minds of the legislators, otherwise the policy of requiring the owners of live-stock to restrain them from trespassing on the crops of others would have been adopted. As it was, virtually all unenclosed land was made into a common on which it was not a trespass for any one to pasture his stock. A legal fence was four and one-half feet high and closed to the bottom, and the owner of any animal breaking through such a fence was liable for damages. The typical fence was a worm or rail fence which, owing to the abundance of timber and the scarcity of saw-mills and nails, was the most economical. In 1639, the law was modified so as not to require the owner of a field to fence against swine. This old policy of allowing cattle to run at large and requiring the cultivators to fence against them has persisted down to recent times, not only in Virginia but in all states settled by Virginians.

In the spring time many cattle were lost in the swamps where, in their weak and emaciated condition, they were mired down. Indians and wolves also destroyed considerable numbers. In 1662, an attempt was made to play one enemy against the other by giving a cow to any Indian chief whose tribe had killed eight wolves. The winters were sometimes very destructive, as many as fifty thousand head having perished, according to accounts, during the winter of 1673. In spite of all these losses, however, the cattle industry continued to flourish.

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[1] Bruce, Economic History of Virginia, Vol. I, p. 233.

[1] Bruce, Economic History of Virginia, Vol. I, p. 314.

Cattle-ranching.—Cattle-ranching in the United States began in Virginia, rather than in Texas, as is commonly supposed. As early as the middle of the seventeenth century it became the habit for planters who had failed, to remove to the remoter districts, driving their live-stock with them. There soon grew up considerable herds of half-wild cattle in these outlying regions where they were sometimes hunted with guns, like deer and elk. In order to distinguish their property the owners resorted to the system of branding and regular "round-ups," every one having his brand registered in the county court. Cow-bells were used also, but only to indicate the whereabouts of the cattle, and not as a means of identification.

This movement, begun thus early, continued in the subsequent history of Virginia, the Carolinas and the Southwest territory, until finally the southern cattle rangers penetrated into Texas where they came into conflict with the Mexican cattle interests. Here the Texan revolution and the Mexican war were precipitated, after which the Texas cattle industry was developed in American hands. Finally, after the Civil war, it moved northward along the great cattle trails into the far Northwest.

Goats and sheep.—Owing to the wolves, sheep did not flourish in the early years of the Virginia colony; but it was noticed that goats multiplied more rapidly than any other animals, except swine. The unlimited forage, their greater adaptability to a wild life, and their greater ability to guard themselves against the attacks of wolves gave them an advantage over sheep.

In recognition of their adaptability, arrangements were made in 1620 to increase still further the number of goats by shipping them by the hundred from Wales. By 1633, they had increased to such an extent as to be exported to New England and other colonies. As late as 1649, according to Bruce, they considerably outnumbered the sheep. By 1672, however, sheep had begun to increase in the more settled parts where the wolves had been exterminated; but it was not till about 1690 that flocks began to be common. From this time forward sheep increased and goats declined in number. Sheep husbandry, however, never attained the importance of cattle-raising.

Horses.—There appear to have been horses from the very first, though they were all killed and eaten along with the other animals during the famous "starving time" of 1609. Others were soon imported, and by 1620 it began to be thought that the so-called native breed were finer than their English progenitors, though the number continued small until after 1649, when there were probably not more than three hundred. About 1665, however, they began to increase in response to the growing esteem in which they were held and a consequent rise in price. Since oxen rather than horses were used as draft animals about the farms, and inasmuch as there were few roads suitable for wheeled vehicles, it appears that the horses were used mainly as pack animals for transportation through the woods (Fig. 15). It was not until the planters had begun to attain to some degree of wealth and luxury that they began to prize the saddle horse. In the closing decades of the seventeenth century, considerable attention began to be paid to the improvement of the breed. Up to this time they had been allowed to run wild in the woods and to breed indiscriminately. Though small in stature, they were regarded as possessing great speed and endurance. In 1686, a law was passed forbidding any one to allow a stallion under thirteen and one-half hands high to run at large.

Fig. 15. A pioneer mode of breaking the land.

The foundation of the English thoroughbred had been laid only about fifty years before by the importation into England of Eastern blood, and the Virginia planters now began to improve their own animals by the importation of blooded animals from the mother country. Nevertheless, there were so many wild horses running in the woods that it became a favorite pastime to hunt them, sometimes with the aid of dogs. Saddle horses were especially trained to this sport. There were also regularly organized round-ups and brandings.

Export crops.—Until 1612, the agriculture of the colony was concerned chiefly with subsistence. The chief exports had been sassafras and clapboards. Some crop was needed that could be exported and sold for cash or exchanged for such commodities as could not be produced in the colony. Such a product was found in tobacco.

Tobacco.—The first experiment in its cultivation was undertaken by John Rolfe, the husband of Pocahontas, who was himself a smoker and dependent upon his own garden, or upon trade with the Indians, for his supply. After 1612, its cultivation became so profitable that, in order to prevent the colonists from giving all their time to it, a rule was made that no one should be allowed to grow tobacco except those who planted two acres of corn. In 1617, it was grown in the streets and market place of Jamestown, and had come to serve as a medium of exchange. In 1619, the principal exports of the colony were tobacco and sassafras, and in the same year an inspector was appointed to see that only tobacco of good quality was shipped.

Tobacco brought a high price and combined large value with small bulk, thus reducing the cost of transportation. While wheat brought only two shillings and a half a bushel, tobacco brought three shillings a pound. It was estimated that a year's labor would produce sixty pounds sterling worth of tobacco and only ten pounds worth of wheat. In 1619 there were 20,000 pounds of tobacco exported, 40,000 pounds in 1620, 60,000 pounds in 1622. After 1623 the price fell rapidly until it sold for less than one penny a pound in 1630; but this condition was only temporary.[1]

In order to keep up the price, or check the fall, a long series of acts were adopted looking toward the restriction of the supply and the improvement of the quality. These acts usually related to the amount an individual was allowed to grow, i. e., the number of plants and the number of leaves to each plant. More and more rigorous inspection was provided for. Restrictions upon the number of plants allowed to each person led to efforts to grow the largest possible plants, and this in turn to the clearing of new and more fertile lands and the abandoning of the old fields as soon as their fertility was slightly impaired. That the production continued to increase rapidly is shown by the fact that in 1639 a special effort was made to restrict the crop to one and a half million pounds.

Cotton.—Though cotton has never figured largely in the agriculture of Virginia, there never has been a time, since the first settlement of the colony, when it has not been cultivated to some extent. Bruce states that the first effort to produce cotton on the North American continent was made in Virginia in 1607, though some of the earlier Spanish explorers are said to have found it growing wild farther south. By 1620 it was counted among the marketable products of the colony, and by 1692 its cultivation had assumed some importance, though it was still regarded mainly as a garden plant rather than as a field crop. This remained true for at least fifty years longer, not only for Virginia, but for the other southern colonies as well.

Agriculture in other southern colonies.

The subject of cotton furnishes an opportunity to transfer our attention from Virginia to the colonies farther south. Though beginning in Virginia, the center of cotton-production moved southward until, at the time of the War of Independence, South Carolina and Georgia had become the chief producers. But even in these colonies there was no such phenomenal development as that which began soon after the Revolution and made the cotton industry the dominating interest in the whole South.

Cotton industry.—The reason for the slow growth of the cotton industry during the seventeenth and eighteenth centuries, in spite of the manifest advantages which the South furnished, was threefold. In the first place, cotton manufacturers were not encouraged in England because the manufacturers of woollens were in a position to dictate the policy of the government. The silk industry was encouraged in the colonies more than was cotton-growing. In the second place, there was no method then known of removing the seeds from the short-staple, or upland, cotton except by hand. There was a device for cleaning the long-staple, or sea-island, cotton, but this variety was not introduced until 1786. The process of cleaning the short-staple variety by hand was so slow and tedious as to be commercially impracticable except in countries like India, where there was an abundant supply of cheap labor. In the American colonies, however, the productivity of labor in other occupations was so great as to make it a losing enterprise to employ it in this tedious and relatively unprofitable work. In the third place, the colonies that were, by nature, best adapted to cotton culture, viz., South Carolina and Georgia, were the last to be settled. Moreover, the first settlers in these colonies located in the tide-water regions which were adapted only to the long-staple variety, which was not introduced until 1786.

The American Revolution, by cutting off supplies of clothing from abroad, forced the colonists to undertake the manufacture of homespun garments on a larger scale, and this, in turn, stimulated the cotton industry.[1] Moreover, certain other crops, such as indigo, had been highly favored by the English government, and, after the outbreak of hostilities, no longer enjoyed a monopoly of the English market. These industries were consequently ruined and the planters were forced to cast about for another crop to supply their place. Cotton seemed to offer possibilities. The subsequent development of this industry belongs in the next period of agricultural development.

General aspects.—In most respects, the agricultural history of the other southern colonies is but a repetition of that of Virginia. The same general systems of landholding and of labor, and the same general methods of farming prevailed. Attention has already been called to the way in which cattle-raising spread southward and westward from Virginia. Corn, wheat, and tobacco spread in the same manner, 100,000 bushels of corn being exported from South Carolina alone in 1792. Such forest products as tar, pitch, turpentine and lumber were, in addition to the regular farm products, exported from North Carolina. Down to the time of the Revolution, rice and indigo were the chief exports of South Carolina, serving the purpose of money crops as tobacco did in Virginia, and, to a lesser extent, in North Carolina. Rice was introduced into South Carolina in 1696, and 100,000 barrels are said to have been exported as early as 1724. Charleston, the center of rice- and indigo-production, and the chief port of exit, became the wealthiest, as well as the most populous city of the South during the pre-revolutionary period.

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[1] Bruce, Economic History of Virginia, Vol. I, p. 300.

[1] See Hammond, The Cotton Industry, p. 12.

Outside of Charleston, cities and towns did not flourish in the South, the economic interests being predominantly rural. This rural life, in its general economic aspects, is well summarized in the following language: "A great plantation, with its galleried manor house, its rows of negro quarters, and groups of barns and shops, was, in large measure, a self-sustained community. The planter needed little that could be obtained elsewhere in his own colony or in the South, and conducted his commercial operations directly with England, the West Indies, and the northern colonies. . . . There were a few negroes on every plantation who were trained in the mechanic arts; and a small number of white craftsmen found work in traveling around the country doing such jobs as were beyond the capacity of the slaves."[1]

Agriculture in the New England colonies.

New England has never been so predominantly agricultural as Virginia and the other southern colonies have been. There has probably never been a time when she has not been in some degree dependent upon some part of the outside world for supplies of agricultural produce. Nevertheless, agriculture has always figured largely among her economic interests, and there was, especially in the early days, a wholesome and attractive rural life.

The land system.—The land system of the New England colonies differed, in certain important particulars, from that of the southern colonies. There were a few grants of land directly to individuals, usually for conspicuous service; but the prevailing custom was to make grants to groups of individuals who wished to found settlements or towns. From the towns, the individual member, in turn, received his grant, subject to certain restrictions. "It was the admirable economic land tenure," says Weeden, "which shaped the early towns; without this, even their religious and political systems might not have established their distinctive system of living." When a town was settled, all members who were admitted to citizenship received grants of land. "They elected, as it were, certain men and families to church membership, and upon these fell the responsibilities of citizenship." Citizenship carried with it, as a matter of course, a share in the land.

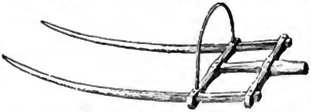

Fig. 16. Old form of hand fork.

Though the greater part of the land was held in severalty, there were commons reserved for the town pasture, and there was much communal work done in the way of fencing and ditching. Inasmuch as all the land in the town, except the commons, was divided up among the original families, these alone, in many cases, were regarded as having rights in the common pasture. Consequently, in later times, when other families came to these towns, a distinction grew up between "commoners" and "non-commoners," a distinction that gave rise to difficulties.

Labor.—Throughout New England, small farms were the rule, and they were generally cultivated by the labor of the owner and his family. Both slaves and indentured servants existed in these colonies, but not in such numbers as in the South. They had comparatively little to do with agriculture, being, for the most part, used as house servants or as helpers in the shops of the dwellers in the towns. The prevalence of small farms, and the lack of a non-land-owning laboring class, made necessary a great deal of coöperation among the farmers. When a farmer had a task that was beyond the strength of his own family, his neighbors turned in and helped, and the occasion was usually made a festivity. House- and barn-raisings, husking-bees, and other events similar in kind, became the typical rural festivals.

It was also customary for the towns to arrange for the herding of live-stock in common. "The Cambridge arrangement is typical of the customs prevailing in 1635, as well as at later periods. Richard Rice was to keep one hundred cows for three months, receiving ten pounds in pay. The town gives him two men to help him the first fourteen days, and one man the next seven days. . . . . He was to pay three pence fine for any night when he failed to bring in all his charge. He could not keep any other cattle without the consent of his townsmen." "Dorchester mentions its keeping of 'cowes and goates' as early as 1633, and in the next year arranges for four bulls to go constantly with the drift of milch cows. . . . The town bull was an important institution, and Windsor, Conn., in 1653, raised a committee to decide what calves should be kept to maturity for the service of the town."[1] Later, as the number of towns multiplied, and the cattle wandered farther into the woods, the General Court decreed that every town should mark its cattle with a brand of its own.

Implements.—The agricultural implements of this period were very few and of the rudest construction, consisting of a wooden plow, a harrow, a spade, and a clumsy wooden fork (Fig. 16). But very few of the farmers owned a plow. In 1637, there were but thirty-seven plows reported in Massachusetts Bay. For a long time after this it was the custom for any one owning a plow to go about and do the plowing for the inhabitants over a considerable extent of territory, as threshing is now done throughout the middle West. It usually required three men and from two to four yoke of oxen to run one of these plows. A town often paid a bounty to any one who would buy a plow and keep it in repair in order that the neighborhood plowing might be done in this way.

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[1] Thwaites, The Colonies, p. 102.

[1] Weeden, Op. cit. Vol. I, pp. 65, 66.

Cattle.—These were first brought into New England in 1624, when three heifers and a bull arrived at Plymouth. Others arrived later and a considerable number were brought to Salem. Owing, however, to the severity of the winters and the depredations of the Indians and the wolves, the numbers dwindled so that by 1636, when they began to be imported from Virginia, cows sold as high as for twenty-five or thirty pounds sterling and oxen for forty pounds a pair.

Most of those brought were of no distinct breed, though some came from the coast of Devonshire. Those from Virginia may have been of mixed Spanish blood. The cattle of that time, even in England, were very inferior to those of the present. The Devons were still unknown as a distinct breed, and it was more than a century after this that Bakewell made his improvements upon the Longhorns, and that Benjamin Tompkins and the brothers Colling laid the foundation of the Hereford and Shorthorn breeds.

In the years 1631–33, however, several importations of Danish cattle were made into what is now New Hampshire by Capt. John Mason. Desiring to enter upon the manufacture of potash, the proprietors imported Danish laborers, and, in the course of several voyages to and from Denmark, brought a considerable number of cattle, chiefly for purposes of draft, but also for breeding purposes. These Danish cattle were of a light yellow color, were larger than the English cattle of that day, were excellent working cattle, somewhat coarse, but strong, hardy and docile.

They are said to have multiplied rapidly and to have remained in some sections with little intermixture down to 1820. Flint, writing in 1861, in his "Eighty Years Progress," says that traces of them were found even at that day, and that they unquestionably did much to lay the foundation of the "native stock" of New England over which they spread. He states further that they came to be mixed with the cattle imported into Salem and Plymouth, and also, probably, with the Dutch cattle of New York. From them the oxen of New England are said to have derived much of their character and reputation for strength, hardihood, quickness and docility.

Cattle-raising never assumed the proportions in New England that it did in the southern colonies, but dairying became an important interest prior to the Revolution. Every farm maintained a few milch cows, and there were some estates, especially in Rhode Island, where upwards of a hundred cows were kept, and butter- and cheese-making were conducted on a scale large for that period.

Field crops.—Among the field crops, corn was always the most important, and the Indian custom of planting beans and pumpkins among the corn was generally followed. Wheat, rye, buckwheat and barley were grown to some extent. There was very little rotation of crops, and scientific agriculture, in the modern sense, was unknown. Owing to the method of settlement in towns and the small size of the farms, the method of tillage was by no means so wasteful of land as that practiced in the tobacco culture of the South. A field was usually cropped until its fertility was so reduced as to make it unprofitable to cultivate it. Then it was laid down to grass until it had time to recuperate.

To accomplish this end, it became necessary to cultivate the natural grasses. The various clovers were just beginning to be introduced into England, red clover having been introduced in 1633, sainfoin in 1651, yellow clover in 1659, and white or Dutch clover in 1700. They were not introduced into America until a much later period. "It is a fact worthy of note in this connection," says Flint, "as it throws much light upon the early farming in this country, that the extensive and practical cultivation of the natural grasses originated here; or, at least, was introduced here long before it was into England. The necessities of our rigorous climate, indeed, compelled attention to this branch of husbandry very soon after settlement, while the climate of England admitted a greater degree of reliance on the wild luxuriance of nature."

This seems to have been the one contribution of the colonies to the science or art of agriculture prior to the Revolution. Timothy, one of the native grasses, has remained the principal hay crop, taking the country over, down to the present day. It derives its name from Timothy Hanson who took the seed from New York to the Carolinas about 1720, and thence to England.

Horse-breeding.—Comparatively little attention was given to horse-breeding in New England until after the Revolution. Before that time, the only distinctive breed to be developed was that known as the Narragansett pacers. The horses of this once famous breed were of small size, but especially adapted to the saddle because of their hardihood, their endurance, and, more especially, because of the comfort which their gait—a natural pace,—afforded to their riders. Little is known as to their origin, but there is a tradition that they were descended from a stallion, known as "Old Snip," that had been brought from Spain and crossed upon the native mares.

There was a great demand for Narragansett pacers in the West Indies. Large numbers also were exported, or sold into the other colonies, about the time of the Revolution, with the result that the stock—never numerous—was practically exhausted. By 1800, it had disappeared as a distinct breed.

Rural life.—The rural life of this period has often been described and has become a part of our national tradition. The town meetings, the quilting-, husking-, spinning-, and paring-bees, the house- and barn-raisings, the log-rollings and similar rural festivities have forever disappeared, but they are much better known than many phases of our contemporary life.

There was little travel prior to 1700, and there were no newspapers. Indeed, there were very few in the country districts at the time of the Revolution. Roads were few and badly kept, oxen were the chief draft animals, and practically every operation about the farm, except plowing and harrowing, was performed by hand. The farmer and his family were clad in homespun and, except for an occasional fowl, seldom tasted any but salted meat from autumn until spring. There were apple orchards on almost all the farms and these were among the most profitable parts of the husbandry of that day.

The term farmer had already come to mean not only the men who rented lands of others, the men to whom the term is restricted in the Old World, but also the small freeholders who made up the greater part of the rural population. Property was divided equally among heirs, and consequently there could be no very great number of large estates.[1]

Agriculture in the middle colonies.

The agricultural history of the middle colonies is difficult to describe because there was less uniformity in their development than in either New England or the southern colonies. The population, even in colonial days, was extremely heterogeneous, being made up of all the nationalities, except the Russian, of northern Europe. Naturally, these various peoples brought various systems of culture with them.

The land system.—With one exception, the land system of the middle colonies resembled that of New England in the sense that grants were made in small tracts to actual settlers, to be held in fee simple, and to be divided among heirs. The exception was the "Patroon System" introduced into New York by the Dutch. A considerable portion of the land bordering on the Hudson river was granted in tracts running from 50,000 to 100,000 acres in extent, to individuals known as patroons, who were a semi-feudal nobility. The system was supposed to foster immigration because the patroons were to exert themselves to secure settlers for their estates, and from whom they were to receive a low rent. The patroons also performed some of the functions of local governors, being supported by rents instead of taxes, and being also expected to support schools and churches.

Labor.—The labor system of the middle colonies resembled that of New England rather than that of the South. There were both indentured servants and negro slaves; their numbers were somewhat larger than in New England, but by no means so large as in the South. They never had any great influence upon agriculture of the middle colonies. The majority of the farmers were freeholders, cultivating by their own labor the land they owned. In Pennsylvania, however, there were a few servants hired by the year, being "washed, lodged, and boarded," and paid, besides, from ten to sixteen pounds sterling.

Implements.—Agriculture was the dominant interest of all the middle colonies as it never had been of New England. The implements were essentially the same, though the author of "American Husbandry" mentions a grain drill, that had recently been invented in England, as being in use in Pennsylvania in 1775. [The reader is referred to Figs. 230–250, Vol. I, and to Figs. 105–129, 192–208, Vol. II.]

Crops.—Among farm crops wheat seems to have held the leading place, at least it figures more largely in the exports of that time, as shown by the tables on page 49. The Pennsylvania millers gained a wide reputation for the excellence of their flour. Many cabbages and turnips were grown in New Jersey, and potatoes in New York. Apple orchards were common, and apples were exported by the shipload to the West Indies. Considerable quantities of cider were made, that and rum being the chief liquors drunk, though some beer was brewed among the Pennsylvania Germans.

New Jersey and Delaware were already famous for their peaches. The author of "American Husbandry," already referred to, says: "Peaches are of a fine flavor and in such amazing plenty that whole stocks of hogs on a farm eat as many as they will, and yet the quantity that rot under the trees is astonishing. . . . Watermelons also are in such plenty that there is not a farmer or even a cottager without a piece of ground planted with them." Speaking of buckwheat, he says: "They make bread, or, more properly speaking, cakes of it, which are eaten by everybody, but its principal uses here, as in Europe, are for fattening poultry and hogs."

The Swedish traveler, Professor Kalm, mentions the irrigation of meadows in Pennsylvania in 1748. No attention seems to have been given either to a scientific rotation of crops or to manuring. It was the custom to grow a succession of crops until the soil was exhausted, and then, as in New England, to allow it to lie idle or fallow for a period of years. Generally it was given over to whatever herbage would grow of itself, but the cultivation of grasses probably made some headway in this section of the country as in New England. Timothy did especially well in some parts of Pennsylvania.

Live-stock.—The cattle of the middle colonies were almost as heterogeneous as the population. The early Dutch settlers in New York brought over the cattle of their native country, probably from the island of Texel. Swedish cattle were brought into Delaware by its first settlers. The New Englanders, who soon came to outnumber all the other English-speaking inhabitants of New York, brought with them their "native stock," which were a mixture of English and Danish breeds, and not improbably of Spanish breeds as well, since some cattle imported from Virginia contained a mixture of Spanish blood. Large herds of cattle were kept in the low and somewhat swampy meadows of New Jersey, and also in the outlying districts of Pennsylvania and New York. Hogs were everywhere abundant, as in all American colonies, running wild in the woods and living on mast and roots. Sheep were somewhat plentiful in Pennsylvania, and the wool of good quality. It was one of the important products.

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[1] See American Husbandry, 1775, p. 67.

There is no evidence of any great activity in horse-breeding, but some attention must have been paid to it, because we find, immediately after the Revolution, a race of large, coarse draft horses, known as Conestogas, in Pennsylvania, where they were used in freighting across the mountains.

Comparative statistics.—The following tables, taken from "American Husbandry," and giving the exports from New England, New York and Pennsylvania, between 1765 and 1775, will illustrate the predominance of agriculture in the middle colonies and its relative insignificance in New England. However, inasmuch as New England agriculture had a considerable non-agricultural population to support, these figures of exports are likely to give one an exaggerated notion of the difference in the agriculture of the two sections.

EXPORTS OF NEW ENGLAND

Codfish, dried, 10,000 tons, at 10 pounds . . .	£100,000
Whale and cod oil, 8,500 tons, at 15 pounds .	127,000
Whalebone, 28 tons, at 300 pounds	8,400
Pickled mackerel and shad, 15,000 barrels, at 20 shillings	15,000
Masts, boards, staves and shingles	75,000
Ships, 70 sail, at 700 pounds	49,000
Turpentine, tar, pitch, 1,500 barrels, at 8 shillings	600
Horses and live-stock	37,000
Potash, 14,000 barrels, at 50 shillings	35,000
Pickled beef and pork, 19,000 barrels, at 30 shillings	28,500
Beeswax and sundries	9,000

EXPORTS OF NEW YORK

Flour and biscuit, 250,000 barrels, at 20 shillings	250,000
Wheat, 70,000 quarters, at 20 shillings . . .	70,000
Beans, peas, oats, Indian corn and other grains .	40,000
Salt beef and pork, hams, bacon and venison .	18,000
Beeswax, 30,000 pounds, at 1 shilling	1,500
Tongues, butter and cheese	8,000
Flaxseed, 7,000 hogsheads, at 40 shillings . .	14,000
Horses and live-stock	17,000

EXPORTS OF PENNSYLVANIA

Biscuit flour, 350,000 barrels, at 20 shillings .	350,000
Wheat, 100,000 quarters, at 20 shillings . . .	100,000
Beans, peas, oats, Indian corn and other grains.	12,000
Salt beef, pork, hams, bacon and venison . . .	45,000
Beeswax, 20,000 pounds, at one shilling . . .	1,000
Tongues, butter and cheese	10,000
Deer and sundry other sorts of skins	50,000
Live-stock and horses	20,000
Flaxseed, 15,000 hogsheads, at 40 shillings . .	30,000
Timber, planks, masts, boards, staves and shingles	35,000
Ships built for sale, 25 at 700 pounds	17,500
Copper ore, and iron in pigs and bars	35,000

Summary of colonial agricultural history.

In reading the accounts of travelers and other commentators upon the agriculture of our colonial era, one gets the impression that this great industry was in a very backward state. The writers are almost unanimous in condemning the wasteful methods of exhausting the land, the lack of intensive farming and of intelligent manuring. It is true that there were comparatively few technical improvements introduced into the methods of farming during that entire period, but it would be a hasty judgment if we were to condemn the colonists for a lack of intelligence.

Agricultural improvements are of two sorts, (1): those that economize labor, and (2) those that economize land. In the use of labor-saving improvements, the colonists were not behind the rest of the world. (Figs. 17, 23-25, 29, 30.) As a matter of fact, the colonial period was drawing to a close when that remarkable series of mechanical inventions that was soon to revolutionize the world, not only in agriculture but in manufacturing and transportation as well, was just beginning to be applied.

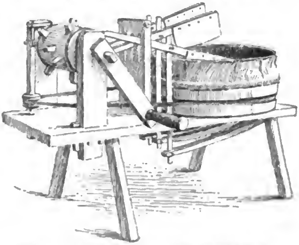

Fig. 17. A machine that was used for chopping meat.

As to those improvements that economize land, the obvious fact was that the colonists had no occasion to make use of that form of economy. We economize in the use of things that are scarce and have to be meted out in order to go as far as possible. Land was the thing the colonists possessed in the most abundance. It would have been poor economy, from their standpoint, to resort to intensive cultivation and manuring to save land, when an apparently inexhaustible supply of fertility lay waiting to be utilized. From the standpoint of future generations, the matter appears different. It must be remembered that no people has ever shown itself willing to sacrifice its present interests in favor of generations in the distant future.

The same tendency to save labor and to waste the land has persisted to the present day. In the use of labor-saving devices, the American farmers have led the world, but they have scarcely yet begun to make use of land-saving improvements. For obvious reasons, it is not likely that they will do so until land becomes as scarce and as high priced as it is in old and thickly populated countries. Until that time comes, our country will remain behind the rest of the world in this kind of agricultural economy.

The first great task of the colonists was that of clearing the land and gaining the mastery over the forces of nature. To this task they brought a degree of energy and intelligence that has seldom, if ever, been equaled. The second great task was to find what crops were best suited to the conditions. This required extensive experimentation and wise selection. This was done so effectually that very little was left to be done by their immediate descendants. During the century that elapsed between the close of the colonial period and the rise of the era of agricultural experiment stations supported by public funds, only a single important new crop, namely sorghum, was introduced into the United States,[1] unless a new variety of cotton, namely the sea-island variety, can be called a new crop. On the whole, therefore, the colonial farmers measured well up to any standard that could reasonably have been set for them.

II. The Period of Westward Expansion—1783-1830

The treaty that closed the War of Independence gave to the liberated colonies all of the territory that lay west of them as far as to the Mississippi. This was all claimed by the individual states. The federal government owned none of it until the states ceded their claims to it during the years 1781-1802. Up to this time, settlers had received their land titles from the colonial or state governments, but from this time on they received them from the federal government.

By the cessions of the individual states the federal government gained jurisdiction over the western territory, but did not gain the ownership of all the land embraced within it, since some of the states had made reservations. Virginia reserved a small empire lying contiguous to herself, including some military lands lying north of the Ohio river. Connecticut reserved a small section of non-contiguous territory lying in the northeastern part of the present state of Ohio. North Carolina pretended to cede the present state of Tennessee, but had already sold land warrants covering every acre of it.

By these various cessions, however, the federal government came into the possession of an immense body of land which was the beginning of the national domain, and upon which was laid the foundation of the public-land policy of the United States. The acquisition of this national domain, the subsequent additions to it, and, more especially, the methods by which these public lands have become private property, form one of the largest and most important topics in our national history. Since the relation of the land to the people, and of the people to the land, is the fundamental factor in every national history, the history of our national development must begin with our public land policy.

The various acquisitions of contiguous lands by the federal government have been as follows:

	Square miles
Cessions by various states, 1781-1802	819,815
Louisiana purchase, 1803	877,268
Oregon, 1805	225,948
West Florida, 1812	9,740
Florida, 1819	54,240
Texas, 1845	262,290
North of the Columbia river, 1846	58,880
California and New Mexico, 1848	614,439
Gadsden purchase, 1853	47,330

Not all of this land, however, was ever the property of the federal government. None of the land in Texas ever belonged to the public domain, and much of the best land in California and New Mexico had been granted to private individuals before these states came under the jurisdiction of the United States.

Beginnings of the public land policy of the United States.

It seems always to have been taken for granted that the public lands were to be disposed of to private individuals. No one charged with the responsibilities of government ever seems to have imagined the possibility of any other method of dealing with them. The only question was whether the method of making the transfer from the government to private owners should be determined by financial or social considerations, that is, whether the transfer should be made a means of enriching the national treasury, or of enriching the settlers directly.

In the early years of our land policy the financial motive predominated, and it was hoped that the Revolutionary war debt with which the federal government was burdened might be wiped out with the proceeds of the land sales. Accordingly, the first sales were arranged in such a way as to bring in cash returns rather than to put the land into the hands of those who needed it most. It was sold in large tracts and for cash. Gradually, however, the social motive came to predominate, until finally the financial motive was lost sight of altogether.

There were five stages in this transition. The first lasted from 1783 to 1800, during which time, as already stated, the land was sold only in large tracts, the minimum being a square section of 640 acres. During this period the annual sales amounted to less than 100,000 acres. The second stage lasted from 1801 to 1820, during which time land was sold in smaller parcels, the quarter section of 160 acres being the minimum, and on credit, and at a minimum price of $2 an acre, though higher bids were encouraged. Payments were at first to be made in four annual installments, but the time was extended and conditions made easier by a series of relief measures. During this period about 18,000,000 acres were sold, but something like 2,500,000 acres reverted to the government for non-payment of dues.

The third stage lasted from 1821 to 1840. At the beginning of this period the credit system was abolished, and the minimum price reduced from $2 to $1.25 per acre. Forty-acre tracts were the smallest that could then be purchased. During this period 76,000,000 acres were sold, and more than half of this amount during the two years preceding the panic of 1837. In fact, speculation in western lands literally ran riot. In 1841 was passed the first general Preëmption Act, though there had been several special preëmption acts prior to this. This was the beginning of the fourth stage in the transition. Under this act the lands were no longer to be open to public sale, but were to be reserved for actual settlers, who were to be allowed to purchase in limited quantities, and at a fixed minimum price of $1.25 an acre, lands upon which they had made an actual settlement. Under this system the sales were steady for twenty years.

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[1] Cf. Bogart, Economic History of the United States, p. 67.

The final stage of the transition was reached when, in 1862, the Homestead Law was passed. Under this law the actual settler who lived upon and cultivated a piece of land, not exceeding a quarter section of 160 acres, was given a title to the land without money and without price. The immediate effect of this measure was to cut down the cash sales under the Preëmption Act, which remained in force for such as cared to take advantage of it, until 1891. Under the Homestead Law 233,043,939 acres had been disposed of up to June 30, 1904.

Since the passage of the Homestead Law there have been various supplementary acts, all, however, aiming in the same direction, viz., the popularization of the land. In 1873 the first Timber Culture act was passed. According to the provisions of this law any person could obtain not more than 160 acres of land by planting one-fourth of it in timber and cultivating it for a period of ten years. Later the amount of timber was reduced to one-sixteenth, and the time of cultivation to eight years. This whole system was repealed in 1891. In 1877 was passed a Desert Land act which allowed any one to take up 640 acres of desert land, that is, land that would not produce agricultural crops without irrigation. It was hoped that this would encourage irrigation schemes under private management, but it proved rather to be a source of fraud. Grants of land for educational purposes, to railroads and to other improvement companies have been numerous, and are important, but they belong, as does the subject of irrigation, to other phases of our agricultural development.

The first ordinance providing for the sale of the public lands was passed in 1785. The most significant feature of this act was the provision for the rectangular system of surveys which is, with very slight modifications, still in use. Briefly, the system is as follows: The territory is divided into townships six miles square, by lines running north and south, and by others crossing them at right angles. Every township is subdivided into thirty-six sections one mile square, and every section into quarter sections, and every quarter section into quarters of forty acres each, this being the smallest fraction surveyed and the minimum amount for which the government will issue a patent. Under the ordinance of 1785 the section of 640 acres was the minimum.

Each row of townships running north and south is called a range, and the ranges are numbered east or west from a line running north and south, known as a principal meridian. Under the ordinance of 1785 the first principal meridian was what is now the western boundary of Pennsylvania. The townships in every range are numbered north or south from a base-line which crosses the principal meridian at a point fixed in advance, from which the whole survey starts. Thus, the first township lying north and west of this point, or, in other words, the first township lying north of the base-line, and west of the principal meridian, would be numbered township 1, north of range 1, west of the first principal meridian. In abbreviated form this would read, Tp. 1. N., R. 1. W., 1st. P. M.

Within the township, the sections are numbered after the following order, always beginning at the northeast corner of the township:

R. 5. W. 1st. P. M.

Tp. 10. N.

6	5	4	3	2	1
7	8	9	10	11	12
18	17	16	15	14	13
19	20	21	22	23	24
30	29	28	27	26	25
31	32	33	34	35	36

Within the section, the quarter sections are designated by their directions from the center, being the northwest, northeast, southwest and southeast quarters. Thus if one wished to describe the quarter section lying in the extreme northwest of the above township, it would be done after this manner. N. W. Qr. of Sec. 6 of Tp. 10 N., R. 5. W. of the 1st. P. M. Within the quarter section, each forty-acre tract is again designated by its direction from the center of the quarter section. Thus if one wished to designate the forty acres lying in the southeast corner of the quarter section just described, it would be done after this manner. S. E. Qr. of the N. W. Qr. of Sec. 6., etc.

This system of surveys and of enumeration is probably of Roman origin and is a model of simplicity and brevity; but the task of surveying such a vast expanse of territory, of recording the surveys, of keeping a record of sales, of entries, and final proofs, and of issuing patents, was a work of great magnitude. It was at first performed under the supervision of the Secretary of the Treasury. In order to organize the work of surveying, the office of Surveyor General was created in 1796, and General Putnam was appointed Surveyor General of the Northwest Territory. In 1810 district land offices were established in the Northwest Territory, and the Surveyor General transmitted plats of the survey to these land offices instead of to the Secretary of the Treasury as he had done before. In 1812 the General Land Office was established under a Commissioner who took immediate charge of the public land system, though still under the general supervision of the Treasury department. This condition lasted until the creation of the Department of the Interior in 1849, since which time the General Land Office has remained under this Department.

The famous Ordinance of 1787 related rather to the government of the territory ceded to the federal government by the several states than to the disposal of the public lands. It provided, however, for a popular form of land tenure, and this is of at least as great importance as the better-known provisions against slavery and for a republican form of government, concerning which so much has been written. The form of land tenure was to be allodial rather than feudal, the land was to be held in fee simple, was to be freely transferable by bargain and sale, and the estates of persons dying intestate were to be divided among their heirs in equal parts. This has determined the form of land ownership throughout the entire West, and even the older states in which certain relics of a feudal tenure still survived have since remodeled their land laws after the pattern set by this Ordinance.

The following table, taken from an article by Professor A. B. Hart,[1] will show how the public lands have been disposed of down to 1883. The figures in the second column, from 1863 down, include homestead and timber culture grants. The first column includes preëmption sales, which, naturally, fell off after the passage of the Homestead law.

Year	Sales	Grants to individuals (other than for internal improvements).	Grants to states (other than for internal improvements).	Grants for internal improvements (to states and corporations).	Total disposition
1787	1,037,259	23,040	......	......	1,060,299
1788	450,727	12,000	......	......	462,727
1792	......	100	......	......	100
1795	......	24 000	......	......	24,000
1796	48,566	2,095,220	......	......	2,143,786
1800	38,365	300	......	......	38,665
1801	360,281	101,700	......	......	461,981
1802	340,010	......	24,216	......	364,226
1803	181,068	36,800	773,608	......	991,476
1804	373,612	......	......	......	373,612
1805	619,266	......	......	......	619,266
1806	473,212	......	......	......	473,212
1807	359,012	13,120	......	......	372,132
1808	213,472	......	......	......	213,472
1809	231,045	......	......	......	231,045
1810	235,878	......	......	......	235,878
1811	288,930	......	......	......	288,930
1812	436,932	4,853,600	832,164	......	6,122,696
1813	145,062	......	......	......	145,062
1814	828,411	......	......	......	828,411
1815	1,075,183	......	......	......	1,075,183
1816	1,473,679	77,232	726,437	......	2,277,348
1817	1,929,142	......	873,664	......	2,802,806
1818	2,388,864	......	1,153,175	......	3,542,039
1819	5,110,628	23,040	1,017,974	......	6,151,642
1820	1,088,012	......	1,291,299	......	2,379,311
1821	781,213	......	......	......	781,213
1822	801,226	......	......	......	801,226
1823	653,320	......	......	......	653,320
1824	749,323	23,000	......	......	772,323
1825	893,462	......	......	......	893,462
1826	848,082	22,508	......	......	870,590
1827	926,728	......	......	791,696	1,718,424
1828	965,600	......	......	833,826	1,799,426
1829	1,244,860	......	......	......	1,244,860
1830	1,929,734	1,422,093	......	29,552	3,381,379
1831	2,777,857	......	......	......	2,777,857
1832	2,462,342	301,280	......	......	2,763,622
1833	3,856,278	200,000	......	......	4,056,278
1834	4,658,219	36,000	......	......	4,694,219
1835	15,934,430	500,000	......	......	16,434,430
1836	20,074,871	......	2,138,117	......	22,212,988
1837	5,601,103	......	......	......	5,601,103
1838	3,414,907	......	......	125,431	3,540,338

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[1] Quarterly Journal of Economics Vol. I, pp. 253, 254.

Year	Sales	Grants to individuals (other than for internal improvements).	Grants to states (other than for internal improvements).	Grants for internal improvements (to states and corporations).	Total disposition
1839	4,976,383	. . . . .	. . . . .	. . . . .	4,976,383
1840	2,236,890	. . . . .	. . . . .	. . . . .	2,236,890
1841	1,164,796	. . . . .	7,906,554	259,368	9,330,718
1842	1,129,218	210,720	. . . . .	24,219	1,364,157
1843	1,605,264	640	. . . . .	. . . . .	1,605,904
1844	1,754,763	144,131	. . . . .	. . . . .	1,898,894
1845	1,843,527	. . . . .	1,997,967	796,630	4,638,124
1846	2,263,731	. . . . .	1,050,709	. . . . .	3,314,440
1847	2,521,306	13,210,360	. . . . .	. . . . .	15,731,666
1848	1,887,553	. . . . .	. . . . .	113,348	2,000,901
1849	1,329,903	1,280	13,831,443	. . . . .	15,162,626
1850	1,405,839	15,733,285	59,998,217	3,751,711	80,889,052
1851	1,846,847	. . . . .	. . . . .	. . . . .	1,846,847
1852	1,553,071	1,735,976	. . . . .	2,514,711	5,803,758
1853	1,083,495	290,534	9,254,079	2,682,171	13,309,855
1854	7,035,735	373,929	92,160	. . . . .	7,501,824
1855	15,729,525	33,993,790	550,893	. . . . .	50,274,208
1856	9,227,879	. . . . .	. . . . .	14,559,729	23,787,608
1857	4,142,744	. . . . .	3,098,710	5,118,450	12,359,904
1858	3,804,908	6,667	. . . . .	. . . . .	3,811,575
1859	3,961,581	. . . . .	3,421,866	. . . . .	7,383,447
1860	3,461,204	. . . . .	3,929,279	. . . . .	7,390,483
1861	1,465,604	. . . . .	13,361,902	. . . . .	14,827,506
1862	144,850	. . . . .	9,600,000	23,504,001	33,248,851
1863	91,354	1,075,775	3,068,231	4,439,143	8,674,503
1864	432,734	1,247,170	6,844,551	47,209,927	55,734,382
1865	557,212	1,141,443	4,031,328	1,328,000	6,057,983
1866	388,294	1,890,847	. . . . .	34,686,075	36,965,000
1867	756,620	1,834,512	. . . . .	126,910	2,718,042
1868	914,941	2,332,151	3,480,281	. . . . .	6,727,373
1869	2,899,544	2,698,481	. . . . .	104,080	5,702,105
1870	2,159,515	3,754,203	. . . . .	1,000,000	6,913,718
1871	1,389,982	4,657,355	76,735	18,903,218	25,027,290
1872	1,370,320	4,595,435	. . . . .	327,903	6,293,658
1873	1,626,266	3,810,536	. . . . .	. . . . .	5,436,802
1874	1,041,345	4,340,795	. . . . .	. . . . .	5,382,140
1875	745,061	2,843,476	3,761,635	. . . . .	7,350,172
1876	640,691	3,467,730	. . . . .	. . . . .	4,108,421
1877	754,789	2,700,808	. . . . .	. . . . .	3,455,597
1878	1,188,108	6,399,892	. . . . .	. . . . .	7,588,000
1879	622,573	8,042,886	. . . . .	. . . . .	8,665,459
1880	850,740	8,224,192	. . . . .	. . . . .	9,074,932
1881	1,587,617	6,791,899	230,400	. . . . .	8,609,916
1882	3,611,530	8,894,731	. . . . .	. . . . .	12,506,261
1883	5,547,610	11,272,844	. . . . .	. . . . .	16,820,454

The South: Cotton and slavery.

Next to the establishment of the public land system, the most important fact in the agricultural history of this period was the rise of cotton to the leading place among the products of the South. At the beginning of the period, tobacco held first place, but cotton passed it in 1803 and soon left it far behind.

A number of factors had contributed to this result. In the first place, there had been a remarkable series of improvements in machinery for spinning and weaving textile fibers, mainly in England, and these had greatly increased the demand for textile fibers on the markets of the world. American cotton was enabled to supply this demand better than any other material, as the result of two fortunate events. The first was the introduction of sea-island, or long-staple cotton in the lowlands of South Carolina and Georgia in 1786. It proved to be well adapted to the conditions and its production increased rapidly. It could be cleaned of its seed by a simple roller gin such as was then in use. But the area within which it could be grown was not large enough fully to supply the demand.

The next event of surpassing importance was the invention, in 1793, of Eli Whitney's saw gin for cleaning the short-staple, or upland cotton. This variety could be grown over a much wider area than the long-staple variety, but could not be cleaned by the roller gin. Only five or six pounds per day could be cleaned by hand by one person by the old method. With the saw gin, however, one man could clean one thousand pounds a day, and this at once made the production of the short-staple cotton, not only commercially possible, but highly profitable. The result was a remarkable development of the cotton-growing industry throughout the whole of the lower South. The rapid spread of this industry was still further stimulated by the liberal public-land policy which has just been described.

What tobacco had done to promote the extension of slavery during the colonial period, cotton accomplished in still greater degree during the period we are now studying. In fact slavery was already growing unpopular, even in the South, under the generous and humanitarian impulses that had brought about the Revolution. There is every reason for believing that it would soon have disappeared from tbe South, as it had already from the North, had it not been given a new lease of life by the rapid spread of cotton culture. The profits of this culture in the lower South had greatly increased the demand for slaves and their price. In 1808 the importation of slaves was forbidden by law, and this tended still further to increase the price of slaves by limiting the supply. The result was that even the non-cotton-growing southern states of Maryland, Virginia, and Kentucky found a powerful financial interest in the perpetuation of the institution. It became profitable to breed slaves for the southern markets.

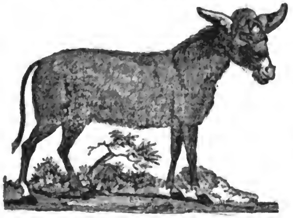

Fig. 16. Type of early agricultural illustration. A jack, from American Farmer, Vol. II (1821), reduced one-half from original cut. This "uncommonly, fine large jack" was owned by John S. Skinner, Maryland Tavern, four miles from Baltimore. He was fourteen hands high and of black color; was imported by an officer of the United States navy from Malta.

There is no sufficient reason for believing that slavery was ever necessary for the growing of cotton. The most successful cotton-growing has always been carried on by free labor. But the odium of slavery was such as to make white laborers unwilling to enter upon an occupation ordinarily given over to slaves. Consequently, when slave labor entered the field of cotton-growing, free labor tended to leave it. Had it not been for slavery it is almost certain that a part of the immense immigration that set in about this time would have gone to the South and the cotton industry would have developed under free-white labor. But the immigrants refused, and have always refused, to go to a community where labor carries with it some of the social degradation, or unrespectability, which always attaches to slave labor.

Aside from its influence in keeping white labor out of the cotton industry, which was by far the most important effect of slavery upon agriculture, three other results are commonly attributed to it. The first was the continuation of the system of "land killing," by which is meant the process of growing one crop continuously upon a piece of land until it is exhausted, and then abandoning it and clearing a new tract. It is doubtful, however, whether this was more due to slavery than to the simple fact of the presence of what seemed like an inexhaustible supply of fertile land to be had for the clearing. Even under free labor there is always the temptation, in the presence of new land to be had for the asking, to resort to new soil rather than to undergo the labor and expense of preserving the fertility of the old.

The second result was the tendency to concentrate the cotton industry in large plantations rather than small farms. Inasmuch as slaves had no interest in their work, it was necessary to provide them with an overseer, and an overseer could superintend the work of a considerable gang of slaves as well as of one or two, which would have been an unprofitable combination. The third result was the continuation of the use of tools and implements of an exceedingly heavy and crude description long after improved implements were introduced into the free states. The reason was that slaves could not be entrusted with lighter and more efficient tools. On the whole, therefore, negro slavery was the most serious obstacle to the real agricultural development of the South.

The following description [1] will give a good idea of the methods of cultivation in vogue during this period, and even later. "Weak-handed planters in selecting a site for a plantation in a timbered region, first cut through the bark a ring around the larger trees. This caused the trees to die. The smaller trees were at once cut down and burned, and the ground broken up and planted, in a few seasons the wind would blow down the deadened trees, which would then be rolled together in log heaps and also burned. Usually a few crops of Indian corn or wheat would be taken off the land before the fields were ready for cotton."

The methods of planting and cultivating cotton while slavery continued were very simple, and with few variations were the same throughout the South. After preparing the ground for cultivation by breaking down the cotton and corn stalks of the previous year, the field was laid off in beds by plowing a furrow between the old rows and lapping on this from four to six other furrows, according to the size of the plow and the desired distance between the rows. The field was thus left in ridges about four feet apart. After the ground had been pulverized by a small harrow, the ridges were split open with a small plow, and the seed was sown into this furrow at the rate of two or more bushels per acre. This was usually done by a negro woman, who carried the seed in her apron and strewed the seed several feet along the furrow at each cast of the hand. The furrow was closed by means of a harrow or a board which had a concave under surface to fit the crest of the ridge, and was screwed to a small shovel or "scooter" plow.

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[1] Hammond's, The Cotton Industry, p. 76.

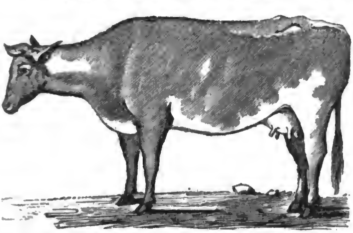

Fig. 19. Type of early illustrating. The Holderness cow. From American Farmer, Vol. II; reduced by about one-third. This cow was "recently imported by G. W. Featherstonhaugh," Duanesburgh. "From center of her horns to the end of her buttocks she measured seven feet and a half, and two feet three inches across her hips." Her hide was silky; her head, small and graceful; her ears uncommonly large and smooth. Her "carcase" was "well-barrelled out and compact," her legs and tail corresponding in fineness; she was judged to weigh 1,200 pounds. (March 23, 1821.)

After this came the thinning, the repeated hoeings and plowings between the rows during the growing season, and finally the picking by hand very much as it is done at the present time. The spread of cotton culture with the industries that were tributary to it, were practically the only changes from the agriculture of the colonial period that the South saw during this period.

Tobacco continued to be cultivated in the northern belt of southern states, but by the same methods that had prevailed during the colonial days. There grew up a considerable stock-raising industry in Virginia and Kentucky, especially the raising of horses and mules, and of cattle in Kentucky.

Mule-raising to supply the cotton plantations became remunerative in this latter state at an early day. In fact, Washington himself may be said to have been the founder of the mule-raising industry in the United States. He was not only the greatest man, but the greatest agriculturist of the period, and became interested in the mule as an animal especially adapted to the climate of the South, and able to endure the treatment accorded to beasts of burden by negro slaves. When it became known that he was interested in mule-breeding, Lafayette and the king of Spain sent him specimens of the best asses of their respective countries as presents. These were the foundation of the fine breed that has since been developed in Kentucky for the purpose of mule-raising. (Fig. 18.)

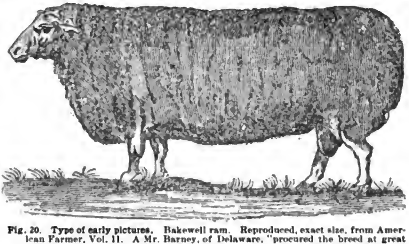

Fig. 20. Type of early pictures. Bakewell ram. Reproduced, exact size, from American Farmer, Vol. II. A Mr. Barney, of Delaware, "procured the breed at great trouble and expense." Their special characters were heads, clean, straight and broad; bodies, round; eyes, fine and lively; bones, very small; wool, long and well suited for common use among farmers, combing and weighing well. They are hardy and, of all sheep yet known, they fatten most kindly and early, being, therefore, admirably calculated for market. (October 20, 1820.)

Agriculture in the North.

The opening up of the western lands caused a most remarkable movement of the population into the northwest territory as well as into the Southwest. Several of the states had lands for sale, and they therefore competed with the federal government in stimulating this movement. From 1785 until late in the nineteenth century, this westward-moving tide of population was the greatest fact in American history (Fig. 27). In these early years the emigrants moved in families and groups of families, mostly in large covered wagons drawn by oxen, and containing the entire stock of household furniture (Fig. 28). The rest of the livestock followed. After the invention of the steamboat, the Ohio river and Great Lakes became highways of the westward movement.

Most of the people who joined this movement were looking for land, some did so for speculative purposes, but the majority had the distinct purpose of becoming farmers. It was not until the latter part of the period we are now studying that the tide of settlers reached the prairies of the West. The lands sought by the earlier settlers all lay within that vast forest which stretched continuously from the Atlantic coast to the western end of Lake Erie on the north, and quite to the Mississippi and beyond, on the south.

The first task of the settler, after locating his claim, was to build himself a house and make a clearing. Except for such timber as was needed for building, the whole forest had to be destroyed before the settler could realize the full value of his land. The American settler entered upon this work of destruction with such energy and ingenuity as to make him the most expert destroyer of forests the world has ever seen. His favorite tool, the ax, he brought to a degree of technical efficiency that is not equaled elsewhere. The length and curve of the handle, its adaptation to the human hand and wrist, the weight and balance of the head, the form and taper of the cutting blade, and the lightness and efficiency of the whole, all combine to make a tool which, from the standpoint of technique, has few equals among the tools of other crafts.

The ordinary method of clearing the forest, when the trees stood thick enough, was to notch the smaller trees on the side toward which it was desired they should fall; then, by occasionally felling a large tree into the midst of them, and in the same direction, it would carry with it, in one mass and tangle, a large number of the trees that had been prepared by being notched. The whole mass was then burned where it lay. In this manner an expert woodman could slaughter an astonishing number of trees in a day. When the trees were far enough apart they were simply girdled and allowed to die, crops being planted meanwhile among them. For this form of cultivation corn was especially adapted, being planted by hand among the stumps and roots, very much as cotton and tobacco were in the South.

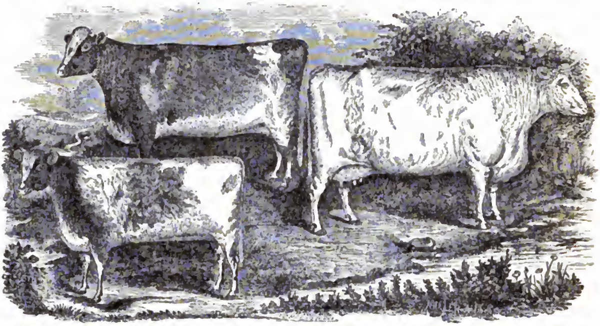

Fig. 21. Types of illustration of middle of last century. "These fine heifers, with three of Mr. Chapman's cows, Ruby, Charlotte and Daisy III, were exhibited at the show of the New York Agricultural Society held at Rochester, in 1851, and won the first prize collectively as 'the three best cows over three years of age, and the three best heifers under three years of age, owned by one person.'' Woodcut (original seven and three-fourths inches) and legend from Vol. V, part I, Plough, Loom and Anvil (December, 1852).

In the older-settled portions of the North, there were comparatively few changes in the general character of the agriculture of this period, though there were some rather significant beginnings that were prophetic of the remarkable transformation that was to come later. One of the first attempts at the improvement of farm implements was made by a southern man, Thomas Jefferson. In 1798, he applied himself to the task of improving the plow, and wrote a treatise on the form of the moldboard; but there is no evidence that any application was made of his ideas in the South. The year before, however, Charles Newbold, of New Jersey, had invented a cast-iron plow having the share, moldboard and landside all cast together. But the farmers of that region were hostile to the innovation and invented the absurd doctrine that it poisoned the land so that crops would not grow. Jethro Wood, of New York, a correspondent of Jefferson, took out patents for an improved cast-iron plow in 1814 and again in 1819. Under his hands the plow began to assume its modern form, for he had, like Jefferson, given himself to the task of designing the moldboard of least resistance.

Aside from these attempts at improving the plow, there were few significant improvements in agricultural implements during this period. There was, however, a distinct growth of interest in improved agriculture as shown by the formation of a number of agricultural societies. In his last message to Congress, in 1796, Washington urged the establishment of agricultural boards "Composed of proper characters charged with collecting and diffusing information, and enabled by premiums and small pecuniary aids, to encourage and assist a spirit of discovery and improvement."

Even before this time, however, the movement had started among private individuals. An agricultural society was organized in Charleston, S. C., in 1784, one in Philadelphia in 1785, another in New York in 1791 and one in Massachusetts in 1792. The last named began soon after to publish a series known as the Agricultural Repository. This society held its first exhibition at Brighton, Mass., in 1816, offering a large list of premiums. A plowing match was held, not so much for the testing of plows as of oxen; but "the plow-maker happened to be there and to have his eyes open,"[1] and from that day the plow began to be improved.

The first national society was probably formed at Georgetown, D. C., in 1809, and held its first exhibition, at which large premiums were offered for the encouragement of sheep, the following year. In the same year, Elkanah Watson's exhibition of three Merino sheep under the great elm at Pittsfield, Mass., was the germ of the Berkshire Agricultural Society, whose regular meetings began the year following.

Some very important developments in the live-stock industry began immediaiely after the Revolution. Though the great English breeds of cattle, the Shorthorns and the Herefords, had only recently been definitely established, American breeders began importing them for the purpose of improving the native stock. (See Figs. 18–22.)

The following statement of facts is culled from Flint's "Eighty Year's Progress." In 1783, three Baltimoreans, Messrs. Goff, Ringgold, and Patton, sent to England for superior breeding cattle. In 1785 a bull from this importation was sent to Kentucky, and others soon followed. Some of these cattle came to be called the "milk breed" and some the "beef breed," though all were known as the Patton stock. It is conjectured that the milch breed were Shorthorns and the beef breed, Longhorns.

In 1817, Colonel Sanders, of Kentucky, sent to England for twelve head of the best that could be bought. Six of them at least were Shorthorns. Two more Shorthorns are known to have been imported to Kentucky in the following year. In 1792–96 a few Shorthorns were brought to Westchester county, New York. In 1818 a Shorthorn bull and heifer were imported into Massachusetts, by Mr. Coolidge and sold to Mr. Jacques, of Somerville. From this bull, known as Cœlebs, Mr. Jacques, by selecting superior native cows, succeeded in developing a fine milking stock long known as "cream pots." In the same year, 1818, Gorham Parsons, of Brighton, Mass., imported a purebred Shorthorn bull, known as Fortunatus, and his descendants were widely scattered throughout New England. In 1825, Mr. Pierce, of Portsmouth, N. H., imported the celebrated Shorthorn, Nelson, and the cow, Symmetry, the parents of the celebrated ox, Americus, who was taken about this country and England for exhibition, after the manner of the celebrated "Durham Ox," of England. In 1824, Mr. Powell, of Philadelphia, began importing Shorthorns for shipment to Ohio and Kentucky, where they contributed to the building up of the fine herds which are still found there.

The Herefords were not so early in gaining recognition in this country as the Shorthorns, the first well authenticated importation of any note having been made by Henry Clay in 1817, when he purchased two bulls and two heifers. In 1824, Admiral Coffin, of the Royal Navy, presented a bull and heifer to the Massachusetts Society for Promoting Agriculture. The bull was kept in Northampton, and left a numerous progeny. But the most active importation of both Herefords and Shorthorns came at a later period.

Two notable events in the annals of horse-breeding occurred in the United States shortly after the Revolution. The famous sire of American trotters, Messenger, a Thoroughbred, was imported from England to Philadelphia in 1788. Since the trotting horse is one of the very few distinctive breeds of live-stock which this country has developed, this event is of special importance. The great Justin Morgan, the sire of the Morgan breed, was foaled at West Springfield, Mass., in 1793. He was taken to Vermont, however, and there laid the foundation for what was, in its day, the most distinctive breed this country produced.

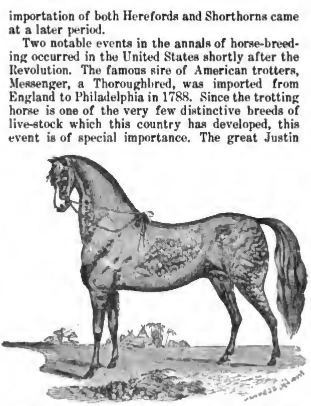

Fig. 22. Illustration of middle of last century. "The above cut represents 'Tartar,' one of three young *entire* horses, of Arabian blood bred by Asa Pingree. Esq., of Topsfield, and now in possession of J. S. Leavitt. Esq., of Salem, Mass. He was six years old in the spring of 1852, and was sired by the imported full-blooded Arabian horse 'Imaum.' 'Tartar' stands fifteen and one-fourth hands high, weighs 900 pounds, and is of a dark-gray color, with dark mane and tail." Woodcut (reduced) and legend from Vol. V, Part II, Plough, Loom and Anvil (January, 1853).

No precise date or origin can be assigned to the Conestogas which became famous in western Pennsylvania as freighters during this period. They are supposed by some to have been descended from some large Flemish horses (the ancestors of the modern Belgians) which the Dutch had brought to New York.

The same period which saw such marked improvements in American horse-breeding saw equally noteworthy efforts to improve the breed of sheep, the first Merinos having been imported in 1793. It was not, however, until a few years later that sheep husbandry in the United States was promoted by a peculiar combination of circumstances growing out of the Napoleonic wars in Europe. "The epoch of non-intercourse brought the necessity for a domestic supply (of wool) forcibly upon the public. Just at this juncture, the Peninsular War threw the Spanish flocks upon the market. Enterprising farmers began importing merino sheep, and by 1809 there were 5,000 in the country. In 1811 was organized the Merino Society of the middle states. Prizes were offered for essays on sheep husbandry and for the best specimens of the Spanish breed. The farmers of New York and New Jersey vied with each other in the quantity and quality of their wool clips. Prices justified heavy expenditure: Merino wool sold at 75 cents a pound in 1811, and ranged from two to three dollars in 1813."[1] In fact, there was a great speculative craze for merinos, and some fabulous prices were paid.[2]

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[1] Flint, in Eighty Years' Progress, p. 25.

Hogs had always multiplied in the frontier settlements, and they now became especially abundant in the Ohio valley, where they flourished and grew fat on the mast which the oak and beech forests afforded. This valley also became a center for the production of corn which, since the clearing of the forests, has become the basis of the hog-raising industry. Ohio, Indiana, Kentucky and Tennessee became the chief hog-producing states during this period, and before the end of it, Cincinnati had become famous as the center of a great pork-packing industry.

The farm life of this period in the new West was, in most respects, a repetition of that of the eastern states in the colonial period. Everywhere there was a kind of rude abundance of the fundamental necessaries of life. Corn and wheat furnished ample supplies of breadstuff; game was abundant, and so were cattle and hogs, so that there was no lack of animal food. There was usually a superfluity of potatoes, squashes, melons and other common vegetables. Tomatoes, known at first as "love apples," were sometimes grown as ornaments, but were not generally eaten until late in this period, because they were commonly supposed to be poisonous. Fruits were generally of poor quality. Wood, as fuel, was everywhere abundant, and clothing was generally of homespun.

But in spite of this simple abundance, it was difficult for the farmers west of the Alleghanies to get money for their produce, because of the lack of local markets and the cost of transporting bulky produce to the Atlantic seaboard. Transportation was mainly by wagon and turnpike. The farmers of western Pennsylvania had begun to convert their grain into whiskey, in which form it combined sufficient value with small bulk to enable it to pay the cost of transportation; but when the Federal government laid a tax upon whiskey, it reduced the profits on this form of enterprise and provoked the "Whiskey Insurrection." About 1805, fat cattle began to be driven across the Alleghanies from the cornfields of the Ohio valley to the eastern cities, mainly Philadelphia and Baltimore. But most of the produce of the Ohio valley which sought an outlet found its way down the Mississippi to New Orleans.

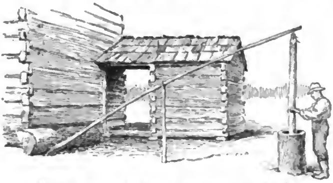

Fig. 23. Grinding or mashing corn with a sweep mill.

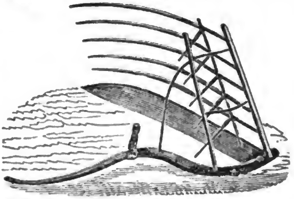

Fig. 24. Early form of grain cradle.

In 1825, however, the Erie canal was opened, and this marks an epoch in our agricultural as well as in our industrial history. New York City at once displaced Philadelphia and Baltimore as the outlet for the products of the great West, and rapidly forged ahead of all its rivals in wealth and population. The Erie canal and the Great Lakes now became the principal channel for the rising tide of immigration to the West, as the Potomac and the Ohio rivers had been before. Moreover, wheat now displaced corn as the breadstuff of the northeastern population, since they could obtain from the West an ample supply of wheat, which stood the transportation better than corn. Wheat became, therefore, the chief money crop of the region bordering upon this northern route, and corn and live-stock remained the principal crops of southern Ohio and Kentucky.

III. The Third Period: The Transformation of the Farming Industry

The period of the transformation of the farming industry was one of the most remarkable in the history of agriculture. It is doubtful if another thirty-five-year period can be found that saw such important changes as those that took place between the years 1830 and 1865.

General character of the period.—There had been, before 1830, numerous improvements in the breeds of live-stock in the Old World, and some in the United States. In Europe, also, there had been important improvements in the handling of the soil, the introduction of root-crops, new systems of rotation, and new commercial fertilizers.

But little attention, however, had been given to these matters in this country. Both in this country and in Europe there had been numerous improvements in farming tools and implements, such, for example, as the improvements in the structure of the plow; but there could scarcely be said to be a single agricultural machine in general use anywhere in the world.

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[1] Coman, Industrial History of the United States, p. 182.

[2] Cf. The History of Wool Growing in America, by C. W. Wright. An unpublished thesis.

At the beginning of this period, practically every part of the work of the farm, except plowing, harrowing, and drawing loads, was done by hand, that is, with tools that were directed and driven by human muscles. Consequently, there had been scarcely any change in the character of farm work for two thousand years. The work had probably improved in efficiency because of the greater efficiency of the tools that had come into use, but these tools were handled, in most cases, essentially as their predecessors had been as far back as we have any history. Small grain was sown broadcast, reaped with a cradle (which was a relatively new invention), and threshed with a flail, or trodden out by horses and oxen. Hay was mown with a scythe, and raked and pitched by hand. Corn was planted and covered by hand, and cultivated mainly with a hoe.

At the end of this period, small grain was sometimes drilled, and, in this country, was almost universally reaped and threshed by machinery. Hay was generally mowed by machinery, raked with a horse rake, and sometimes lifted onto the stack or into the mow by horse power. Corn was planted and cultivated by horse power. Thus, though all the improvements that had been made prior to 1830 scarcely changed the character of farm work in a single important particular, the improvements that were made during these thirty-five years entirely revolutionized the character of many of the leading operations of the farm.

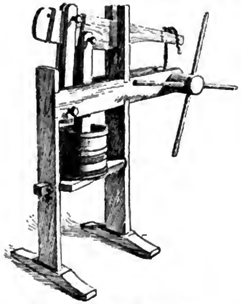

Fig. 25. Early form of cheese press.

There were more improvements of the same sort to follow after the close of this period, but enough had already been done to change completely the work of the farmer. It is doubtful if all the improvements that have taken place since have made as much real difference in the life and labor of the farm as those that were made during this period.

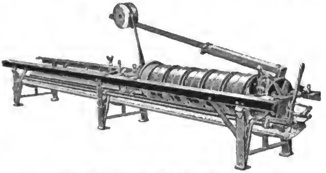

Fig. 26. A modern form of cheese press.

One phase of this transformation that is seldom appreciated was the change in the kind of power used on the farm. When the plow, the cart and the harrow were the only implements calling for other than human power, the cheapest and lowest form of power was most economical. That is to say, oxen could be used to advantage because the work of drawing the crude and heavy implements could be satisfactorily performed by these powerful, but slow and stupid beasts. Since they could stand exposure, and could shift for themselves better than horses, their maintenance cost less in a community where stabling and care were important items of expense. Besides, the oxen were beef-producers and their labor was, in a certain sense, a by-product. Moreover, yokes and chains cost less than harness.

Under the circumstances, it was natural that oxen rather than horses should be the principal draft animals in use on the farms. But they are far less satisfactory than horses for the drawing of farm machinery, or even of the more complicated tools such as the riding-plow and the cultivator. Therefore, as soon as farm machinery came into general use, oxen were out of date and were discarded by the more progressive farmers. By the end of the period, the horse and mule had generally displaced the ox as a draft animal on the farms of all except the more backward districts.

This period saw also a general change from the self-sufficing to the commercial system of agriculture. Long before 1830, however, there had been, in almost every part of the country, some specialized growing of money crops; but nowhere, except in the cotton-belt, had it become so general as really to characterize the agricultural industry as a whole. And, after 1865, there were still many farmers who tried to grow everything they needed, so far, at least, as the geographical conditions would permit. Thus the two systems shade off into one another and are not sharply separated. But by the latter date, the method of specializing on the more profitable crops and buying such other products as were needed had made such headway

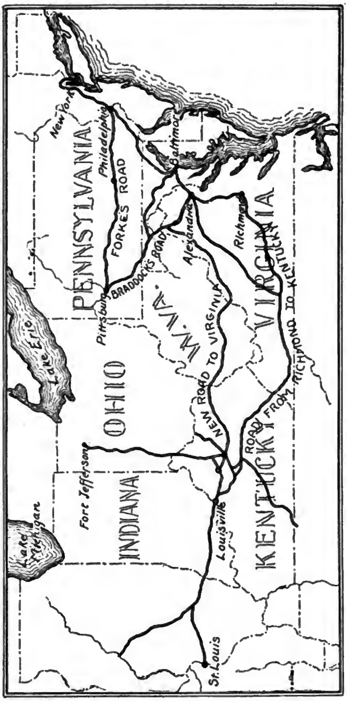

Fig. 27. Roads into the Western Territory before 1850.

as to be the characteristic form of agriculture throughout the greater part of the country.

The cotton-belt.

This general transformation of the character of the agricultural industry did not extend into the southern cotton-belt. Though the production of cotton increased by leaps and bounds, being six times as great in 1860 as it was in 1830, it was due mainly to a mere expansion of area rather than to any marked improvement in the methods of cultivation. This increase of area took place, first, by an expansion of the cotton-belt westward into new territory across the Mississippi, especially in the state of Texas; second, by an increase of the cotton area of the older states, especially in the three states of Alabama, Mississippi and Louisiana. Owing to lack of transportation facilities prior to 1830, the plantations had tended to fringe the navigable waterways; but with the coming of the railroads the back country was made available. By the outbreak of the Civil war, one-half of the whole cotton crop was grown in the three states just mentioned. But, even at that time, only a small fraction of the tillable land of the cotton-belt was in cotton. It was estimated that the entire acreage in cotton was less than that of the state of South Carolina.[1]

In the region of sea-island cotton, however, it was found that the price of the staple varied considerably according to its quality, and that its quality depended upon the care taken in its cultivation. This led the planters of this region to take special pains to improve their methods of cultivation. But the great bulk of the crop was of the upland variety, and there seems to have been no general or systematic attempt to improve its quality, the effort being rather to increase the quantity by spreading over more and more land.

In the lower, or Gulf region, however, a new variety, known as Orleans, or Gulf cotton, was introduced. It was superior to the ordinary upland variety, though resembling it in most particulars. It was supposed to have been a cross between the upland and sea-island varieties.[2]

The labor continued to be performed by slaves. They were generally owned by the planter himself, but sometimes hired from other owners. It became the established custom to drive them in gangs under an overseer. Since the success of the overseer was gauged by the amount of cotton he could make, and since he had no personal or financial interest in the welfare or the longevity of the slaves, this system sometimes resulted in the overworking and rapid wearing out of this form of property. This abuse was likely to be especially flagrant when the owner did not live on his own plantation.

It has been estimated that the average cost of maintaining a slave for a year on a large plantation was not far from fifteen dollars, though on the small plantations it often amounted to thirty or forty dollars. Rations, consisting of corn meal, molasses, bacon and, sometimes, vegetables, were issued to the slaves once a week, and they were sometimes allowed to cultivate truck patches and to keep poultry and a pig. The rapid spread of the cotton-belt westward into new and richer lands increased the market value of slaves considerably. In 1836, it was estimated that the average value of a good field-hand was $600. This was already a large advance over what it had been before the rise of cotton to its position of predominance. In 1849, they were said to be selling for $500, $750, and even $1,000; but by 1860 prime field-hands were reported as selling for $1,400 in the Southwest.

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[1] Cf. Hammond, The Cotton Industry, p. 74.

[2] Cf. Hammond, Op. Cit. p. 75.

Throughout the cotton-belt, the one-crop system of farming prevailed, that is, cotton was the only money crop. Corn, the crop next in importance, was grown only for domestic use, being the chief breadstuff for the maintenance of the slaves and the chief grain ration for the mules. It was also used for the fattening of hogs for the domestic supply of bacon, which was the only animal food entering into the regular rations of the negroes. Many plantations, however, did not produce enough of either corn or bacon for their own use. Hogs were sometimes especially difficult to raise because of the disposition of the slaves to steal and roast the young pigs.

During this period, immigrants were pouring into the United States by the hundreds of thousands; but they uniformly avoided the South, being repelled by the presence of slavery and the accompaniments of that institution. Though the population spread rapidly westward in the cotton-belt, it was by natural increase mainly. Moreover, since the region was predominantly rural, the population spread itself very thinly. In 1860, there were but eleven cities in that whole region that had a population of over 8,000.

The border states.

The border states of Maryland, Virginia, Kentucky, and Missouri, were, at this time, developing some diversified farming. Slavery continued to be an important economic interest by reason of the advancing market for negroes in the cotton-belt. In fact, as early as 1829, Henry Clay expressed the opinion that slave labor would not generally be employed in Kentucky were it not for the high prices they would bring in the markets farther south. In these border states, as the price advanced, slaves were not kept for growing crops, but crops were grown for the purpose of raising slaves. Of the crops grown in these states, tobacco was the one that fitted best into the business of slave-breeding.

In this, as in the cotton industry, there were no material improvements in methods during the period of transformation. The live-stock industry, corn- and wheat-growing, and, to a certain extent, fruit-growing, were making rapid progress; but the history of these industries belongs to the general history of the transformation that took place farther north.

The transforming agencies.

The agency that did most to bring about this transformation was the railroad. Before 1830 there were no steam railroads in operation in the United States. By 1860 they had penetrated into every state east of the Missouri river, and there were more than 30,000 miles in operation in the country. The increase was especially rapid between 1850 and 1860, railroad-building having been stimulated by grants of millions of acres of public lands.

By this enormous increase in transportation facilities, the farmers of the West were enabled to market their crops and to get from the outside world a great many articles that had been, for most of them, unattainable before. From this time forth the life of the farmer, even of the pioneer farmer, was changed. The settlers on the western plains since 1865 have never known such isolation as was the common lot of settlers in the Mississippi valley before the coming of the railroads.

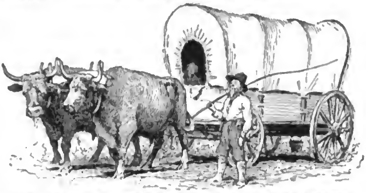

Fig. 28. The emigrant's wagon, usually known as the "Prairie Schooner."

While the railroads were bringing people of different sections nearer together, other means of communication were also developing. In 1844, the first telegraph line was opened between Baltimore and Washington, and, by 1860, more than 50,000 miles were in operation. In 1850, letter postage was reduced to 3 cents for all distances under 3,000 miles.

While the markets of the world were thus being brought nearer to the western farms, a number of circumstances were combining to expand those markets. The home market for agricultural produce was being increased by the rapid development of manufacturing industries in the eastern states, particularly in New England.

England repealed her corn laws in 1846 and allowed American grain and other food-stuffs to be imported free of duty. Her manufacturing industries were growing rapidly, and she was becoming a large consumer of our farm products. In the same year occurred the great Irish-potato famine. In 1848, Europe was disturbed by a series of political revolutions, and in 1854 occurred the Crimean war. The combined result of all these occurrences was to increase the dependence of Europe upon the United States for food-supplies. During the fifties the gold fields of California poured out an increasing flood of gold. This also had its effect in stimulating prices.

While all these forces were combining to increase the demand for our farm products, several new factors were working to enable our western farms to supply that demand. Under the Preëmption Act of 1841, a more liberal land policy, which resulted in putting the lands of the West into the hands of actual settlers, was inaugurated. [See p. 51.] As a result of the famines and political disturbances in Europe, immigration to the United States increased by leaps and bounds, and many of the immigrants found their way to the West, where they took up government land under the preëmption system, and thus became independent farmers. It is estimated that the total number of immigrants from 1790 to 1820 was only about 200,000. The following table shows the immigration by decades since 1820.

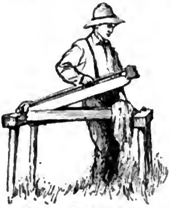

Fig. 29. Breaking flax.

1820–1830	143,439
1830–1840	599,125
1840–1850	1,713,250
1850–1860	2,598,214
1860–1870	2,314,824
1870–1880	2,812,191
1880–1890	5,246,613
1890–1900	3,844,359

Another factor, scarcely less important, was the settlement, during this period, of the great prairies of the middle West. During the preceding periods, most of the settlements had been made in the great primeval forests that stretched westward from the Atlantic coast. Just before the opening of the present period, the vanguard of the army of settlement emerged from this forest into the great natural prairies of the upper Mississippi valley. During those earlier years, as stated above, the first task of the settler, after the construction of a shelter, was the clearing away of the forest. This was a laborious process, requiring years of the most strenuous toil. Even after the trees were felled and burned, the stumps and roots remained to interfere with the plow and harrow, and to vex the soul of the farmer. Ten, and even twenty years' were sometimes necessary to bring such a farm into condition for easy and effective cultivation.

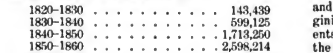

Fig. 30. Old form of hay fork.

The settler on a prairie farm, on the other hand, escaped all this. He could begin plowing at once, his only hindrance being the natural toughness of the prairie sod. He sometimes raised a fair crop of sod-corn the first year. After two or three years of cultivation, the sod rotted, and the soil, rich with thousands of years of vegetable mold, became as friable and as easily cultivated as that of the old and highly improved farms of the eastern states, or of Europe.

Sometimes, it was not even necessary to plow the land before a crop could be raised. Furrows were plowed across the field at intervals of about four feet, the corn planted in the bottoms of these furrows and covered with a hoe. The soil was so rich, and there were so few weeds and insect pests, that a fair crop would grow with practically no cultivation. The usual method, however, was to plow the land and plant the corn in the upturned sod, sometimes using an ax or a mattock instead of a hoe, because of the toughness of the sod. For the turning of this sod, a heavy breaking-plow of a special design was used, usually drawn by three or four yoke of oxen.

By far the most important factors in the transformation that was taking place were the inventions of farm machinery. William Manning, of New Jersey, was granted a patent for a mowing-machine, in 1831. Obed Hussey, of Baltimore, and Cyrus McCormick, of Virginia, were each granted patents for reaping-machines, the former in 1833, and the latter in 1834. These first machines were not very successful, but they were improved until their practicability had been demonstrated, and, after 1840, they began to come into general use.

The invention of the reaper was one of the most important events in the history of modern industry. A threshing-machine was in use during the thirties, and by 1840 its use had become so general that the greater part of the grain crop was threshed in this manner. These first machines, however, merely threshed the grain, which still had to be separated from the straw and chaff, either by hand-winnowing or by means of a fanning mill. It was not until about 1850 that separators were combined with the threshers so that the grain came from the machine cleaned and ready for the market. These machines were usually run by horse-power. Steam-threshers were known as early as 1860.

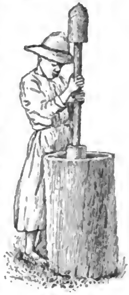

Fig. 31. Crude method of mashing corn.

The use of reapers, mowers and threshing-machines was "given a great impetus by the success of American machines at the World's Fair in London, in 1851, and at an exhibition near Paris four years later. 'The triumph of the American reapers,' said the official report at London, 'worked a new era in agriculture.' At the Paris exhibition a trial of mowing-, reaping- and threshing-machines was made, and of the results a correspondent of the "New York Tribune" wrote: "Six men were set to threshing with flails at the same moment that the different machines commenced operations, and the following were the results of half an hour's work:

Six threshers with flails . .	60 liters of wheat
Belgian thresher	150 liters of wheat
French thresher	250 liters of wheat
English thresher	410 liters of wheat
American thresher	740 liters of wheat"

"In the trial of reapers the following was the result in a field of oats: An Algerian machine cut an acre in 72 minutes; an English machine in 66 minutes; and an American in 22 minutes."[1]

John Deere made his first steel plow from an old saw blade in 1837. This was an event of more importance than appears on the surface because it solved a difficult problem in the cultivation of the prairie soil. This soil is exceedingly fine, being almost entirely free from grit, and inclined to be sticky. It was, therefore, difficult to get a plow to scour, and in this respect the steel plow was much superior even to the cast-iron plow that had come into use about 1825.

Somewhat less revolutionary, but scarcely less important than the mower, the reaper and the thresher, were the corn-planter and the two-horse cultivator which came into use during this period. By means of these effective implements the farmer's ability to raise corn was greatly increased. Every part of the work of growing corn, except that of husking the crop, was thus done by horse-power before 1865, except in certain sections where corn is a minor crop. It is doubtful whether even the grain-harvesting machinery effected a greater saving of labor, corn being our principal crop.

Live-stock.

The Thoroughbred stallion, Denmark, was brought into Kentucky in 1839, and became the foundation of the breed of American saddle horses. It was during this period that interest in the trotting horse began to take definite shape. Before this period it was prized mainly for racing purposes, but now its practical importance as a road horse began to be appreciated. "Up to 1840 the buggy was practically unknown, the common mode of travel being on horseback." "Perhaps the most important event" in the horse-breeding industry of the country during this period, "was the importation into Ohio of the Percheron stallion, Louis Napoleon, from which dates a great improvement in the draft horse."[2]

Hogs continued to multiply and to flourish, nourished by the corn crops of the western prairies. Cincinnati remained the center of the pork-packing industry until 1861, when it was surpassed by Chicago. Chicago had become, in fact, by the end of this period, the greatest market for agricultural produce in the world,—a position which it still holds. It was and is the center of the region of prairie farming, probably by nature the richest agricultural region yet developed in the entire world.

There was practically no increase in the number of sheep during this period. Cattle increased more rapidly, especially on the prairies, which furnished natural pastures of high excellence. Systematic efforts continued to be made to improve the breeds of cattle by means of importations of breeding animals, mainly from England. A great impulse was given to the breeding of Shorthorns by the organization, in 1834, of the Ohio Company for Importing English Cattle. Agents were sent abroad who selected nineteen head from the herds of celebrated breeders and brought them back. They were kept together under the care of an agent for two years, others being imported meanwhile, and the whole herd was then sold at public auction and scattered widely through the state. A dividend of $280 per share was realized from the whole transaction. The same experiment was tried the following year and was equally successful. After 1840 other importations increased very rapidly, and surprisingly high prices were paid, individual animals frequently bringing $5,000 and $6,000.

The result was a great improvement in the cattle of the country, and there have been herds of thoroughbred Shorthorns in this country ever since that are equal to those of the mother country. In 1840, Messrs. Corning and Slothan, of Albany, N. Y., imported five bulls and seventeen cows and heifers of the Hereford breed, and other importations were added subsequently. There has never been any such excitement over the Herefords, however, as marked the speculative period of the Shorthorn fever of the forties and fifties. In fact they did not really become popular until the rise of the range-cattle industry upon the western plains where their special adaptation to the conditions won them recognition.

The rise of the new prairie states and the rapid expansion of prairie farming caused a decline of agriculture in New England, and, to some extent also, of other eastern states. The tendency that later culminated in the wholesale abandonment of the hill farms of New England began to attract attention by 1840. General farming in competition with the West was no longer possible, and only those locations that were suitable for dairying or market-gardening continued to prosper. The development of dairying led to attempts to improve the breeds of dairy cattle. A few Ayrshires were imported by the Massachusetts Society for promoting Agriculture prior to 1860; but the chief interest was in the Jerseys. This society imported them in considerable numbers, and in 1853 there were seventy-five pure-bred Jerseys in Massachusetts.[1]

"Up to 1850, all the butter and cheese was made on the farm, but in the next year the associated system of dairying known as the American system was inaugurated by the invention of the cheese factory, of which twenty-one were built by 1861."[2]

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[1] See Bogart's Industrial History of the United States, p. 239.

[2] Bogart, op. cit., pp. 242, 243.

[1] See Flint's Eighty Years' Progress.

[2] Cf. Bogart, op. cit., pp. 243, 244.

General summary.

The census of 1840 was the first in which the statistics of agriculture were collected; consequently we have no accurate knowledge of the total value of our agricultural production for any year before that date. The following table from Bogart's Economic History shows the agricultural expansion from 1840 to 1860. The principal agricultural products are given in millions.

Product	1840	1850	1860
Improved farm land, acres . .		113.0	163.1
Corn, bushels	377.5	592.0	838.8
Wheat, bushels	84.8	100.4	173.1
Oats, bushels	123.0	146.5	172.6
Rye, bushels	18.6	14.1	21.1
Buckwheat, bushels	7.3	8.9	17.5
Barley, bushels	4.1	5.1	15.8
Potatoes, bushels	104.2	104.0	153.2
Hay, tons	10.2	13.8	19.0
Butter, pounds		313.3	459.6
Cheese, pounds		105.5	103.6
Wool, pounds	35.8	52.5	60.2
Cotton, bales of 400 pounds . .	1.5	2.4	5.3
Tobacco, pounds	219.1	199.7	434.2
Rice, pounds	80.8	215.3	187.1

During the preceding period, as we have already seen, a beginning had been made in the formation of agricultural societies and the holding of agricultural exhibitions. But this movement received a great acceleration during the period now under discussion. By 1860, nearly every state had its agricultural society, and almost every county as well. In most of the states, agricultural fairs or exhibitions were held; the county fair had become an established institution almost everywhere. These annual gatherings, with their opportunities for seeing what was new in agricultural machinery, live-stock, and farm products, had a powerful influence in stimulating improvements and spreading knowledge.

IV. The Period of Agricultural Expansion: The Far West

Rapid as had been the expansion of agricultural production during the period immediately preceding the Civil war, that of the period immediately following was still more rapid. The Civil war itself scarcely imposed even a temporary check upon the agricultural development of the North, though it completely disorganized the cotton industry of the South and involved it in temporary ruin. The improved machinery that had already come into use for the harvesting and threshing of small grain and for the planting and cultivation of corn enabled the North to increase its production of these crops in spite of the drain upon its labor force. It was estimated that in 1865 there were 250,000 reapers in use in the United States. But the greatest expansion came later.

Immigration.—Between 1859 and 1863 the wheat crop of Indiana increased from about 15,000,000 bushels to 20,000,000 bushels, though about one in every ten of her male population was in the army at the latter date. Moreover, this drain upon the labor force of the North was in part made good by immigration from Europe, which continued, though in reduced numbers, during the years of the war. During the decade from 1860 to 1870, as many as 2,314,824 immigrants arrived, practically all of whom settled in the northern states, and most of them in the western group, now known as the north central states, that is, the states north of the Ohio river, west of New York, and east of the Missouri river. The population of this group of states, sometimes called the grain states, increased more than 42 per cent during this decade.

During the decade from 1870 to 1880 over 297,000 square miles, or a territory equal in extent to Great Britain and France combined, were added to the cultivated area of the United States.[1] During the same decade the immigration amounted to nearly 3,000,000 persons, a number almost equal to the entire population of the country at the time of the War of Independence. But during the succeeding decade, the number of immigrants reached the astonishing number of 5,246,613, and many of them still continued to find their way onto the western farms. The following figures from the United States census will show the increase of the principal grain crops since the census began to enumerate such matters:

	Corn, bushels	Wheat, bushels	Oats, bushels
1839 . .	377,531,875	84,823,272	123,071,341
1849 . .	592,071,104	100,485,944	146,584,179
1859 . .	838,792,742	173,104,924	172,643,185
1869 . .	760,944,549	287,745,626	282,107,157
1879 . .	1,754,591,676	459,483,137	407,858,999
1889 . .	2,122,327,547	468,373,968	809,250,666
1899 . .	2,666,440,279	658,534,252	943,389,375

The values of agricultural implements manufactured during the census years from 1850 to 1900 were as follows:

1850	$6,842,611
1860	20,831,904
1870	42,653,500
1880	68,640,486
1890	81,271,651
1900	101,207,428

Even more significant was the rapid growth of the exportation of breadstuffs from the United States. This did not begin on a large scale until after 1860, but from that date it increased by leaps and bounds until, by 1880, this country had become the largest exporter of wheat in the world. Only a small fraction of the corn crop has ever been exported, the greater part being fed to live-stock.

Homestead law.—Of the agencies that produced this great expansion of agricultural enterprise and production, one of the most important was the Homestead Law of 1862.[2] The policy of giving land free of cost to actual settlers naturally tended to

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[1] Bogart, op. cit. p. 267.

[2] See p. 51.

Plate IV. Fitting potato land, and planting. A Pennsylvania farm scene

encourage the rapid settlement of the public domain. This was still further stimulated by the disbanding of the immense armies of the Civil war. Had it not been for our free-land system, this might have resulted in a glut of the labor market. But Congress so modified the Homestead Act as to make it especially easy for every ex-soldier of the Union army to acquire a title to government land, allowing him to deduct the time he had served in the army from the time which the ordinary settler was required to live upon and cultivate the land before he could acquire title to it. The rising tide of immigration still further increased the agricultural production under this free-land system. Another factor, not to be passed over lightly, was the large number of horses and mules set free for productive work by the disbanding of the armies. These were sold, many of them to farmers, and this is, by some, regarded as the date of the general displacement of the ox by the horse in agriculture.

But one result of this over-rapid settlement of the western lands was the partial disorganization of the agriculture of the eastern states. So eager were the settlers to acquire land that this motive, rather than a preference for agriculture itself, led many to take up land and turn farmers. Instead of acquiring land for the purpose of growing crops, the order was, in many cases, reversed, and crops were grown in order that the settler might acquire land, that is, in order that he might occupy his time during the period that the government required him to live upon his land. Frequently, if not in the majority of cases, the crops were grown at a loss, if the farmer had counted his own wages as a part of the cost of growing them; and if he had counted the cost of restoring to the soil the fertility the crops had extracted, they were generally grown at a loss. But the farmer counted the anticipated rise in the value of his land as a part of his compensation.

The result was naturally an over-supply of farm products, and this was felt in the older sections of the country as well as in the newer. Side by side, therefore, with this wonderful expansion of the cultivated area and the consequent increase in agricultural production, there grew up a vast amount of agricultural discontent. This, in turn, gave rise to a series of farmers' movements, beginning with the Grange movement of the early seventies.

Transportation.—Scarcely less important than the factors already named as a contributor to the agricultural development of this period, were the great improvements in railway transportation that have taken place since the Civil war. The substitution of steel for iron rails, the organization of the great trunk-line systems, the building, in connection with the trunk lines, of the so-called "granger roads" permeating every part of the grain states, and the building of the transcontinental lines, all contributed to make every nook and corner of the great West accessible, and to enable the farmers even of the far West to compete on almost even terms with those of the East.

Along with the building and organization of the railroads, there was developed a remarkable system for the handling of grain and live-stock. The refrigerator car, first brought into use for long distance traffic in 1869, gave a great impetus to the meat-packing industry, since it could now run continuously throughout the year. This soon led, in 1876, to the exportation of fresh meats to foreign countries. The system of grading and classifying grain enables large amounts of the same grade to be handled in bulk and at a very small expense per bushel. The building of immense elevators in which it can be handled and stored in large quanties, where cars can be loaded and unloaded in an incredibly short time, and where vessels can be loaded at the rate of 8,000 and 10,000 bushels an hour, has also contributed to the general expansion of the trade in agricultural products and the opening up of a world market for the American farmer.

Inventions.—Among the inventions of agricultural machinery that were made during this period the twine-binder was by far the most important. Even at the present time, except in the semi-arid belt where the harvesting does not need to be done so expeditiously as elsewhere, and where the huge combination harvesters can be used, the harvesting of the grain crop is the crucial point. The farmer has to ask himself, not, "How much grain can I grow?" but, "How much can I harvest with such help as I can get?" The amount of grain that can be economically grown in any section is limited by the amount that can be harvested. Before the invention of the twine-binder, the harvesting of the grain crop was a much more difficult problem, and since the amount that could be harvested in any community was necessarily much smaller than now, the amount that could be produced economically was necessarily much smaller also. In other words, it was the twine-binder, more than any other single machine or implement, that enabled the production of grain, especially of wheat, to expand to its present magnitude. The per capita production of wheat increased for the country as a whole from about 5.6 bushels in 1860 to about 9.2 in 1880.

Numerous minor improvements were made in threshing machines, the net result of which was a considerable increase in their efficiency, but none of these improvements has so revolutionized the grain-growing industry as did the twine-binder. In the early seventies steam began to displace horsepower in threshing, but the substitution was not complete until near the end of this period.

Though not itself an agricultural invention, the roller process of manufacturing flour was another factor of considerable importance in our agricultural expansion. The flour made from spring wheat by the old process was of an inferior quality, and many of the best agriculturalists were unable to see any future for that crop. But, by the new process, better flour could be made from spring wheat than had ever been made from winter wheat. This at once stimulated the growing of spring wheat, especially in Minnesota and the Dakotas, which were especially adapted to it. The population of these three states increased from 453,887 in 1870 to 915,950 in 1880. Whereas Rochester, N. Y., had been the greatest flour-manufacturing center in the country, it almost immediately surrendered to Minneapolis the position of leadership as soon as the roller process came into use.

Chief among the improvements in machinery for the planting and cultivation of corn was the "check rower." This device, attached to the corn-planter, enabled one man to do the work which had formerly required two, as it automatically dropped the seed in rows running across the field at right angles to the direction in which the planter was driven, thus planting the crop in rows running in two directions and permitting of cross-cultivation.

In the drier regions west of the Missouri river, corn came to be generally planted by means of a "lister," a double moldboard plow throwing a deep furrow, in the bottom of which the corn is planted by an automatic dropper. Since this method leaves the rows running in one direction only, it does not permit of cross-cultivation; but it has certain advantages, chief of which is that the deeper planting enables the crop to withstand drought more successfully. The weeder, the riding cultivator, the disc harrow and cultivator, and a number of other implements, were devised to lighten the work of the corn-grower and to enable each man to tend a larger crop. The bulk of the corn crop continued to to be harvested by hand, no very satisfactory machine having been designed for that purpose. Fortunately, there was no such pressing need as existed in the case of wheat for a quick method of harvesting, because the gathering of the corn crop may safely be prolonged over several weeks.

H. W. Quaintance, in his admirable monograph on "The Influence of Farm Machinery upon Production and Labor,"[1] gives us the accompanying tables, showing his estimates of the amount of saving effected by the improvements in farm machinery for various crops between various dates, and the reader is referred to his article on page 108.

Day's-work Necessary to Produce

BY HAND METHODS

	Crop of	Methods of	Day's-work
Barley	1896	1829–30	14,771,515
Corn	1894	1855	117,487,098
Cotton	1895	1841	80,108,771
Hay	1895	1850	99,257,257
Oats	1893	1830	105,810,334
Potato	1895	1866	14,715,501
Rice	1896	1870	396,687
Rye	1895	1847–48	6,854,942
Wheat	1896	1829–30	130,621,927
Total			570,024,032

BY MACHINE METHODS

	Crop of	Methods of	Day's-work	Day's-work saved by machinery	Per cent
Barley . .	1896	1895–96	630,354	14,141,161	95.7
Corn . . .	1894	1894	45,873,027	71,614,071	60.9
Cotton . .	1895	1895	28,178,904	51,929,867	64.8
Hay	1895	1895	18,556,791	80,700,466	81.3
Oats . . .	1893	1893	11,334,266	94,476,068	89.2
Potato . .	1895	1895	5,134,100	9,581,401	65.1
Rice . . .	1896	1896	108,889	287,796	72.5
Rye	1895	1894–95	2,739,147	4,115,795	60.0
Wheat . .	1996	1895–96	7,099,560	123,522,367	94.5
Totals . .	. . . .	. . . .	119,655,038	450,368,992	79.0

Cattle-ranching.—During the period now under discussion, the cattle industry of the far West underwent a phenomenal development. Cattle-ranching had its first beginning, as already stated [See p. 44], in the Virginia colony; but after the acquisition of Texas it was entirely reorganized. The descendants of the Spanish cattle brought over by Cortez and his followers had multiplied rapidly in the mild climate of northern Mexico and Texas, where they had run half wild for 200 years. Their Mexican owners had paid little attention to them except to gather a periodic harvest of hides and tallow, the only products of the cattle industry for which there was a market.

Under American domination, however, the ranching business in Texas was eventually taken over by American cattle-men, and various attempts were made to open up a market for Texas beef. A few Texas cattle were driven to Illinois as early as 1857, but they did not become popular. During the Civil war there was no outlet for the surplus cattle of Texas, but they continued to multiply as rapidly as ever, so that, as a consequence, the ranges were ready to swarm in the late sixties.

It had been discovered that the short grass of the northern plains was very nutritious and would support cattle even during the winter season. This discovery was said to have been made by accident by a teamster who was hauling supplies to a United States fort in Utah, in the winter of 1864–5. Being overtaken by a snow-storm in the Laramie plains, his feed was soon exhausted and he turned his oxen out, as he thought, to perish. They lingered near the camp, and when spring came were found to be in better condition than when they were turned loose. The winds had here and there laid bare the cured buffalo grass, and the oxen had fed upon it for nearly four months.[1]

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[1] Publication of the American Economic Association, 3d Ser. Vol. V. No. 4, p. 29.

[1] Cf. J. H. Patton, The Natural Resources of the United States, pp. 387–8. Also, Joseph Nimmo, Report Regarding the Range and Ranch Cattle Business of the United States, Washington, Government Printing Office, 1885.

It was soon discovered that, owing to the superior quality of the grass on the northern ranges, Texas cattle gained more rapidly in weight if driven north than if they remained in Texas, the estimated difference in the weight of a four-year-old steer being about two hundred pounds. Moreover, the beef matured on the northern ranges was of superior quality. Naturally, therefore, the Texas cattle began to move northward into these new ranges, following, in general, the western line of settlements. They sought first the ranges of Kansas, Nebraska, Colorado and Wyoming, and were kept out of the territories farther north by the danger from the Indians. But after the Custer massacre, in 1876, the government began to adopt more severe measures toward keeping the northern Indians on their reservations. When, as a result, conditions became more settled, the vast ranges of the Dakotas, Montana and Idaho, where the grass was especially good, were opened up, and the great cattle-trail was extended to the northern boundary of the country.

From 1870 to the close of this period, the Texas cattle-trail became pretty well marked as the route over which vast numbers of cattle drifted northward from the breeding-grounds of Texas. The cattle thus driven were mainly young steers from one to two years old, besides some heifers for stocking the northern ranges. Matured beef cattle were also driven to the shipping-points in Kansas and Nebraska. Inasmuch as cows seemed to be more prolific in Texas, a territorial division of labor grew up, Texas furnishing the young and immature cattle, and the northern ranges maturing and fattening them for the market.

The points where the cattle-trail crossed the transcontinental railways became great cattle markets and shipping-points. From 1870 to 1872, Newton, Kansas, on the Atchison, Topeka & Santa Fé, and Abilene, on the Kansas Pacific, were the principal shipping-points. As settlements moved westward, the cattle-trail moved in advance and, a little later, Great Bend, Kansas, on the Atchison, and Ellsworth, Kansas, on the Kansas Pacific, became the chief shipping-points. Again, they were Dodge City, Kansas, on the Atchison, and Hayes City, Kansas, on the Kansas Pacific. In 1885, the principal points were Dodge City, as above, and Ogallala, Nebraska, on the Union Pacific. It was estimated that, during the year 1884, 400,000 head of cattle were driven to these two points for shipment. After 1885 the importance of the cattle-trail began to decline, partly because of the westward advance of the line of settlements, and mainly because of the competition of the railroads, such as the Missouri Pacific system, and other lines which were built into the very heart of the cattle country.

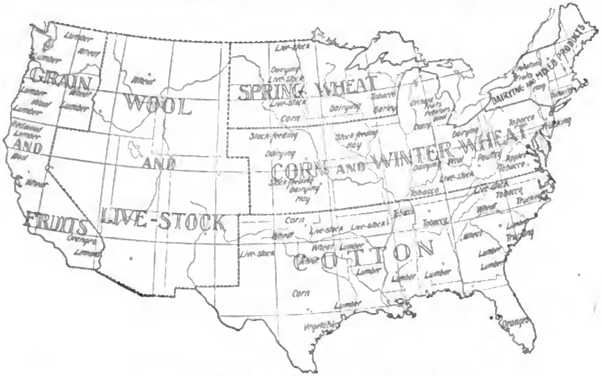

Fig. 32. Map of the agricultural resources of the United States.

The following table, from the report already mentioned, by Joseph Nimmo, shows the estimated number of cattle driven northward from Texas over the old cattle-trail from 1866 to 1884.

1866	260,000	1876	321,000
1867	35,000	1877	201,000
1868	75,000	1878	265,000
1869	350,000	1879	257,000
1870	300,000	1880	394,000
1871	600,000	1881	250,000
1872	350,000	1882	250,000
1873	465,000	1883	267,000
1874	166,000	1884	300,000
1875	151,000		

But cattle-ranching continued to expand for a time after the decline of the old cattle-trail. Contiguous to the range country lay the corn-belt, which formed another important factor in the cattle business. Range cattle began to be shipped in large numbers into the corn-growing regions of eastern Kansas and Nebraska, Iowa, Missouri, and Illinois, to be fattened upon the corn crops. It was therefore in the corn country rather than the range country that the great packing-houses were built, that is, in such cities as Kansas City, St. Joseph, Omaha, Chicago, and St. Louis. Owing to the practice of allowing hogs to fatten on the droppings of the corn-fed cattle, pork came to be, to a large extent, a by-product of the beef industry.

Butter and cheese.—As previously stated, the manufacture of butter and cheese in factories instead of on the farms, had begun before the Civil war; but it did not become general until after that epoch-making event. Cheese-making developed rapidly under the factory system during the late sixties and the seventies; but after 1880 butter-making began to displace it and soon eclipsed it altogether. The early centers of the butter-making industry had been in the eastern and middle states, especially New York, Vermont, and Massachusetts, Orange county, N. Y., butter being very highly regarded. Later, a great butter-producing district developed in northern Illinois, southern Wisconsin, eastern Iowa and southeastern Minnesota; and Elgin, Ill., became one of the greatest butter markets in the world.

The Babcock test, for determining the butter-fat of milk, and the centrifugal separator for extracting the cream without having to "set" the milk and wait for the cream to rise, were important factors in this development. One factor, frequently overlooked, but perhaps as important as any, is found in the habits of the American people. Next to the French, the Americans are the principal bread-eaters of the world; but, unlike the French, they eat butter on their bread. In short, the Americans are probably the largest consumers of butter in the world. Moreover, it is their custom to eat very little cheese. These facts probably account for the rise of the butter-making industry and the relative decline of the cheese-making industry. Add to this the fact that each European country has its own special and local taste in the matter of cheese, and we have an explanation of the lack of demand for American cheese in Europe.

Cotton.—The most violent agricultural change of this period was in the cotton-growing industry of the South. The emancipation of the slaves, and the financial ruin that overtook most of the planters as a result of the Civil war, necessitated a complete reorganization of that industry. This was encouraged by the high prices prevailing at the close of the war on account of the long cotton famine in England, resulting from the blockade of the southern ports. Cotton sold for 43 cents a pound in 1865, and for 30 cents in 1866. Such prices led many of the southern planters to undertake the production of cotton on a large scale with borrowed capital and hired labor. Over-production soon led to a fall of prices to an unremunerative level and involved the planters in ruin. This failure of the large-plantation system was followed by experiments in cotton-growing on small farms by white men, and occasionally by negroes, who bought small tracts for that purpose. Even such large plantations as remained were cultivated mainly by negro tenants who hired small tracts and worked them "on the shares." Under this new system the industry revived, and by 1879 the annual production exceeded that of 1860. Moreover, there was somewhat more diversification of crops under the new system, but never very much. When the negro tenant (or laborer) furnished his own mules, seed and tools, he usually received from two-thirds to three-fourths of the crop; but when, as usually happened, these things were all furnished by the owner of the land, the crop was usually divided equally.[1]

Following this reorganization of the cotton industry there grew up a most vicious system of agricultural credit, which has probably done more than any other single factor to keep southern agriculture in a backward state. Driven by the necessities of the situation, the planter has been compelled to borrow credit of a local merchant, at exorbitant rates, for the equipment and running of his farm. The loan was usually secured by a lien on the crop, and this was drawn in such terms as to make the lender the dictator and practically the master of the planter. In the first place, the lender insisted that the planter's efforts be concentrated upon the cotton crop, because this was the most marketable product and would always bring spot cash. In the second place, the planter was compelled to buy all his supplies from the lender, since it was not money, but only credit that was loaned at the store. Since the chief articles of merchandise in which the merchant dealt were corn and bacon, he naturally discouraged the planter from producing them for himself. Yet these products can both be grown with advantage throughout the South. "The raising of corn would not only give a less marketable crop into the hands of the merchant, but it would eventually lose him his customers, for the raising of his own supplies would release the farmer from the necessity of doing business on a credit basis."[2]

V. The Period of Reorganization

The year 1887 is chosen as the beginning of the present stage of the development of American agriculture, primarily because that was the year in which the Experiment Station Act (Hatch Act) was passed by Congress. This event was, in many ways, the beginning of a new epoch in our agricultural history, that is, it was the beginning of a more comprehensive and systematic application of the principles of experimental science to agriculture than had been attempted before. There had been experiment stations in several of the states before this time, but the establishment of a central office in Washington for the coördination of their work was a signal for renewed activity along this line. Whereas there had been but twenty of these experiment stations established prior to 1888, twenty-six new ones were established in that year alone. The cumulative results of the experiments that have been carried on in these various stations, where the methods of exact science are applied to the solution of agricultural problems, form the chief factor in the development of what some are pleased to call "The New Agriculture."

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[1] Cf. Hammond, The Cotton Industry, Ch. IV.

[2] Hammond, op. cit. p. 151.

Close on the heels of this new movement followed other changes almost equally important. The practical exhaustion of the supply of arable land in our public domain has closed that avenue for agricultural enterprise. This means that the increasing demand for agricultural produce can not be so easily supplied by merely extending the cultivated area westward; it must be supplied mainly by increasing the productivity of the lands already under cultivation. A number of forces, in addition to those already mentioned, are operating in the same direction. The practical exhaustion of the supply of free land has been followed by a considerable rise in the price of the lands in the middle West, and by a check in the fall of the price of those further east. This rise in the value of farming land will of itself produce a more careful and intensive system of cultivation.

Where land is cheap and labor dear, there will always be wasteful and extensive farming, and it is useless to preach against it. There are two ways of growing a hundred bushels of corn. One is to plant four acres of soil after very slight preparation, and to follow by very inadequate cultivation. The other is to plant one acre after the most thorough preparation and to follow by a very thorough and scientific cultivation, using, on the whole, more labor than is required by the former method. Where land is cheap and labor dear, the former method is the more economical, and will be followed, as surely as water will flow downhill. But, where land is dear and labor cheap, the latter method becomes the more economical, and will be followed with equal certainty. As land becomes gradually more expensive relatively to labor in this country, the inevitable tendency is, and will be, for American agriculture to gravitate in the direction of the latter method.

Irrigation.—There are large portions of the public domain in which every element of productivity is present, except water. This necessitates irrigation. Irrigation systems were first developed on a small scale, and by private or local enterprise. Within this period, however, statesmanlike men have begun to see that the full possibilities of irrigation can be realized only when developed under comprehensive schemes of such vast extent as to require the management of the national government. There is yet to be built an irrigated empire in the West; it will require men with the vision of statesmen and courage that will not balk at difficulties, to build this empire. [The reader is referred to the articles by R. H. Hess and Elwood Mead, Chapter IV.]

Drainage.—Serious attention has only recently been turned toward the project of draining the vast swampy region that borders the Atlantic coast, stretching almost continuously from New Jersey, through Virginia and the Carolinas, and ending in the Everglades of Florida. It is estimated that there are 80,000,000 acres of these swamps, now not only practically valueless, but a hindrance to travel and a menace to health. Drained and reduced to cultivation, they would support a population of 10,000,000 people,—a small empire in itself. Obviously such a project as this can be carried out comprehensively only by the national government. These irrigation and drainage schemes furnish opportunities for government enterprise that should appeal to aggressive men with large views, because these are projects too vast for private or even local enterprise. Such proposals as that the government shall take over and try to manage enterprises that have already been built up and conducted successfully under private management must seem paltry and unconstructive in comparison with these plans for actually building something new and of the greatest importance to the country.

The extension of the area of cultivated farms up to the borders of the arid belt, and the development of irrigation schemes within that belt, have already begun to cut down the range for the cattlemen. Consequently the ranching industry has already declined considerably. Moreover, much of this arid pasture is better suited to sheep than to cattle; sheep are therefore gradually displacing cattle in many parts of the range country. It is too early to predict that cattle-ranching is doomed to extinction, but it is safe to say that it will decline still more, and that it will never regain the importance it held during the seventies and eighties. There is a possibility that cattle-raising, on a somewhat smaller scale than that which developed on the western range country, may be revived in the hilly and semi-mountainous country of the eastern states, from Maine to Georgia. These lands are too broken to compete with the lands of the middle West in the growing of crops, but they furnish excellent pasturage, and there is not the slightest scarcity of water.

Agricultural colleges.—Following the increased activity of the experiment stations has come a new appreciation of the value of agricultural education. The agricultural colleges have begun to offer, in addition to the full, regular courses, short winter-courses on special topics, for the benefit of farmers. Lately, in coöperation with the railroads, they have been sending out special lecturers, with moving laboratories, in order to bring the instruction as near as possible to the farmers. A certain humorist, in commenting upon the riding plow and other implements of a similar kind, once spoke of farming as a sedentary occupation. It now looks as though it were in a fair way to become a learned profession. There is no profession, unless it be that of medicine, that requires as thorough a scientific training as agriculture, as it is now coming to be practiced by its best representatives.

In spite of the marvelous growth of American agriculture, and its apparent prosperity, it is doubtful if it has ever been self-supporting in any strict sense before the present period. The average farmer had never counted the partial exhaustion of the soil as a part of the cost of a crop. Taking the country over, it is probable that, other things equal, if the farmers had been compelled to buy fertilizers to maintain the fertility of their soil without depletion, the whole industry would have become bankrupt. The day when the average farmer begins to keep his profit and loss account in such a way as to charge the depletion of his soil to the loss account just as he would the repairing of his tools and the insurance on his barn, will deserve, for several reasons, to be recorded as the birthday of The Reorganized American Agriculture.

INTRODUCTION OF LEADING CROPS AND FARM ANIMALS INTO NORTH AMERICA

Apple. First trees in New England planted on Governor's island, in Boston Harbor, from which "ten fair pippins" were picked on October 10, 1639. Nursery of young trees planted on the farm of Governor Endicott, at Salem, in 1640. Native cider became a favorite beverage as early as 1650, several cider-presses going. (Weeden, Economic and Social History of New England. p. 188.) Planted in Governor Berkeley's orchard, in Virginia, in 1641. Probably earlier orchards in Virginia, but not recorded. (Bruce, Economic History of Virginia, I:337.)

Apricot. Planted in Governor Berkeley's orchard, in Virginia, in 1641.

Artichoke, Jerusalem. Native of America and cultivated by the Indians.

Ass. Brought to West Indies by Spaniards, and thence to Mexico about 1591. In 1620 the Virginia assembly voted to send to France for eighty asses. Brought into Connecticut for mule-breeding from the Cape Verde Islands shortly before the Revolution. Brought into the South for the same purpose about the same time. Two fine jacks, sent to George Washington by Lafayette and the King of Spain, were the beginning of the breed of the improved jacks of Virginia and Kentucky,

Barley. Sown by Gosnold on one of the Elizabeth islands (now Cuttyhunk) in 1602; by the settlers at Jamestown, Va., in 1611. Exported from New York to Holland in 1626. Grown in Massachusetts Bay colony in 1630.

Bean. Common, or kidney beans, probably natives of America; cultivated by the Indians. European kind said to have been planted by Gosnold on Elizabeth islands in 1602. Cultivated by Dutch in New York about 1644, and in Virginia about the same time.

Bees. Not native of America. Date of first introduction unknown, but known to have been early in our colonial history. Spread and became wild in the woods. Reached the Mississippi before 1800, and the Pacific coast before 1850.

Blue Grass. Native of America. Usually sprang up without artificial propagation in the wake of the early settlements.

Buckwheat. Introduced by Dutch into New York in 1625. Cakes consumed in New York and New Jersey. Grown in New England for animals and poultry before 1771.

Cattle. Brought from Spain to West Indies in 1493, by Columbus on his second voyage. Thence to Mexico about 1525, and to Florida about 1538. Brought by Portugese to Newfoundland in 1553. Brought by French to Acadia in 1604, to Canada in 1608, to the present state of Illinois in 1682. Brought by English to Jamestown, Va., in 1608. Several cows and a bull brought in 1610, and as many as 100 head in 1611. Many Spanish cattle from West Indies also brought to Virginia at various times. Brought from England (Devonshire) to Massachusetts in 1624, from Holland to New York in 1627, from Denmark to New Hampshire in 1631, from Holland to Massachusetts in 1635.

Cherry. Trees planted in Governor Berkeley's orchard, Virginia, in 1641. Grown in Massachusetts as early as 1663.

Chickens. Brought by Spaniards to West Indies in 1493. Brought by first settlers to Jamestown, Va., in 1607. Brought into all the colonies at very early dates. Poultry exported from Massachusetts to London between 1631 and 1662.

Clover. Date of its first introduction not positively known. It was first introduced into New England by Jared Eliot, who died in 1763.

Corn (Maize). Native of America; cultivated by natives from great antiquity.

Cotton. Certain varieties native of America. Found by Columbus in Cuba in 1492, by Cortez in Mexico, and by Magellan in Brazil in 1519, by Pizarro in Peru in 1532, by Cabeza de Vaca in California in 1536. Grown in Virginia as a garden crop in 1608.

Cranberry. A native of America; not cultivated by Indians.

Flax. A kind of wild flax was found in Virginia by the first colonists (Bruce, I: 100). In 1619 it was required that all who received grants of land in Virginia should grow some flax. Introduced into New York and fiber exported to Holland as early as 1626. Governor and Company of Massachusetts Bay known to have ordered both flax and hemp seed from England in 1628, although it may have been grown earlier. Enough grown in 1642 for domestic supply of clothing in Massachusetts. (Weeden, 157.)

Goats. Probably brought to West Indies by Spaniards in 1493. As early as 1608 it was observed that goats prospered in Virginia. (Brown, Genesis of the United States, I: 176.) Angora goats introduced into the United States in 1849.

Grapes. Several species of wild grapes natives of America. Said to have been found by Leif Ericson and his followers in 1000. Four varieties found by first settlers in Virginia. European varieties introduced into Virginia in 1619. (Bailey, Evolution Native Fruits.)

Hemp. Seed ordered from England for Massachusetts in 1628. Grown in considerable quantities in 1642. Grown in Virginia in 1648—probably much earlier.

Hogs. Brought to West Indies by Columbus in 1493. Brought from Cuba to Florida by De Soto in 1538. Brought by Portuguese to Nova Scotia and Newfoundland in 1553. Brought by English to Virginia in 1608. Brought by Governor Winslow to Plymouth colony in 1624. Brought by Dutch to New York in 1625. Everywhere they multiplied rapidly and ran wild in the woods.

Hops. "Hop rootes" ordered from England by Governor Winslow, of Plymouth, in 1628; cultivated only as a garden crop. Brought by Dutch to New York as early as 1646 Brought to Virginia before 1648.

Horses. First brought to the New World by Columbus in 1493. Brought from Cuba to Florida by Cabeza de Vaca in 1527, but all perished. Brought by De Soto in 1538. These were abandoned by his followers after his death, and they may have become the progenitors of the wild horses of the western prairies. French brought horses to Acadia in 1604, thence to Canada in 1608. In 1609, six mares and a horse brought from England to Jamestown, Va. In 1625, brought by Dutch to New York. These were Flemish horses, and may have been the progenitors of the Conestogas. Brought from England (Leicestershire) to

Massachusetts by Higginson in 1629. In 1635, two Dutch ships brought twenty-seven Flemish mares to Massachusetts. (Weeden, Economic and Social History of New England, 128.)

Indigo. Cultivation attempted, without success, in Virginia in 1619. Successfully grown as early as 1649. Introduced into South Carolina, from East Indies, in 1741, where it became a staple crop until the Revolution.

Muskmelon. Said to have been found growing wild in Virginia by first colonists (Bruce, I:98), but the muskmelon is really native to Asia.

Oats. A species of wild oats found by first colonists in Virginia. European variety sown by Gosnold in Elizabeth islands in 1602. Grown in all the colonies since the earliest years of their settlement.

Orchard grass. By some regarded as native of America. Artificially propagated from seed about 1750. Introduced from Virginia into England about 1764. (Flint.) Usually considered to be an Old World grass.

Peach. Mentioned in Virginia in 1629. (Bruce, I:332.)

Peanut. Native of South America; cultivated by Indians.

Peas. A kind of pea cultivated by Indians in Virginia before European settlement. European varieties planted at Plymouth in 1621.

Pineapple. Native of America; cultivated by Indians.

Potato. Native of Peru. Cultivated from great antiquity. Probably not cultivated anywhere within present limits of the United States prior to European settlement. Brought to Virginia, probably from West Indies. Planted at Jamestown in 1607.

Pumpkin. Supposed to be native of America; cultivated by Indians.

Red pepper. Native of America; cultivated by Indians.

Rice. Grown in Virginia in 1649, but not very successfully. Introduced into South Carolina from East Indies in 1696; became a staple crop.

Rye. Cultivated in all the colonies at an early date. Rye-flour mixed with corn meal (Indian meal) in the making of bread as early as 1630.

Sheep. Spanish sheep brought to West Indies in 1493 by Columbus; thence to Mexico, exact date not known; to Florida in 1565, to California in 1773. English sheep introduced into Virginia in 1609, into Massachusetts in 1624, kept on islands in Boston Harbor as early as 1633. Dutch sheep brought to New York in 1625.

Squash. Supposed to be native of America; cultivated by Indians.

Strawberry. Native of America; not cultivated by Indians. Found growing wild in great abundance by first settlers in Virginia. Plots of ground reserved for them in early clearings. Our present cultivated strawberries probably derived indirectly from Chilean stock. (Bailey, Evolution of Our Native Fruits.)

Sweet-potato. Native of tropical America; cultivated by Indians.

Timothy. By some regarded as native grass, but probably European; propagated from seed by one Herd or Heard, in New Hampshire, hence sometimes called Herd's grass. Seed taken from New York to North Carolina by Timothy Hanson—hence called Timothy—in 1720.

Tobacco. Native of America; cultivated by Indians from great antiquity. Found by Columbus in Cuba on his first voyage in 1492, and by all subsequent explorers.

Tomato. Native of South America; cultivated by southern Indians. Regarded by American settlers as poisonous until about 1840.

Watermelon. Planted in Virginia in 1607. Seed probably brought from West Indies.

Wheat. Said to have been sown by Gosnold in Elizabeth islands in 1602. Cultivated at Jamestown, Va., in 1607 and every year subsequently. Sown at Plymouth in 1621. Cultivated by Dutch in New York as early as 1626.

HISTORIC FARM ANIMALS

By *M. W. Harper*

No history of American agriculture is complete that does not give due consideration to the individual farm animals that have marked epochs in the development of our domestic live-stock. The influence of a certain few individuals has, to no small extent, determined the types of our present-day horses and cattle. Among the most notorious and influential of these individuals may be mentioned Hambletonian 10, Justin Morgan, Louis Napoleon, Normandy and Success, among horses, and Success 2nd (5031) and 8th Duchess of Geneva, among beef cattle. The more important facts concerning their influence are brought out in the following paragraphs.

Hambletonian 10. (Fig. 33.)

No horse of any breed or period, in this or any other country, has excited so much interest, or represented such a vast sum of money in his descendants, as Hambletonian 10, commonly called "Rysdyk's" Hambletonian, the great progenitor of speed. This horse was bred by Jonas Seely, of Sugar Loaf, Orange county, New York. He was foaled in 1849, got by Abdallah 1; dam, the Kent Mare, by imported Bellfounder; grandam, One Eye, by Hambletonian, son of Messenger; great grandam, Silvertail, by imported Messenger; great great grandam, Black Jin, breeding unknown. Hambletonian 10 was sold with his dam, the Kent Mare, when a suckling, to Mr. William M. Rysdyk, of Chester, Orange county, and he remained in Mr. Rysdyk's hands until he died, in March, 1876, at the age of twenty-seven years.

A brief description of Hambletonian 10 is somewhat as follows: In color, a beautiful bay with black legs; mane and tail black, full and ornamental; small star and two white ankles behind. When at his best, he stood 16 hands 1¼ inches high. He was two inches higher over the rump than over the withers; shoulders oblique, deep and strong; withers low and broad, well-muscled back and loin, hips long and croup high, with great length from hip to hock; thighs and stifles well-muscled. It was over the hind-quarters that we find lodged the powerful muscles that, imparted to his sons and daughters, have ever placed them in the front ranks as trotters. In general appearance he was plain, indeed, homely. His heavy fore-quarters and heavy hind-quarters, connected with a long and perfect barrel—two sizes too small for the ends—showed a very poor proportion. In action, his movements were frictionless, although he had a movement peculiarly his own.

Since Hambletonian 10 was so great a sire of speed, there has been much speculation as to his own record, and whether or not he was ever tracked. John H. Wallace, editor of Wallace's American Trotting Register, has the following to say on the much-mooted question:

"In the autumn of 1852, Mr. Rysdyk and Mr. Roe—the owner of Roe's Abdallah Chief, then four years old—concluded to exhibit their sons of Ab-

Year	Age	Mares covered	Per cent of foals	Foals drop'd	Service fee	Total fees
1851	2	4	75	3	$25 00	$75
1852	3	17	76	13	25 00	325
1853	4	101	78	78	25 00	1,950
1854	5	88	70	62*	35 00	2,170
1855	6	89	72	64	35 00	2,240
1856	7	87	73	64	35 00	2,240
1857	8	87	72	63	35 00	2,205
1858	9	72	75	54	35 00	1,890
1859	10	95	70	66	35 00	2,310
1860	11	106	68	72	35 00	2,520
1861	12	98	69	68	35 00	2,380
1862	13	158	70	111	35 00	3,885
1863	14	150	61	92	75 00	6,900
1864	15	217	67	148	100 00	14,800
1865	16	193	67	128	300 00	38,400
1866	17	105	71	75	500 00	37,500
1867	18	72†	58	42	500 00	21,000
1868	19	None	Sick			
1869	20	22	81	18	500 00	9,000
1870	21	22	72	16	500 00	8,000
1871	22	30	86	26	500 00	13,000
1872	23	30	80	24	500 00	12,000
1873	24	31	65	20	500 00	10,000
1874	25	32	75	24	500 00	12,000
1875	26	24	8	2	500 00	1,000
		1,930	69	1,333		$207,790

*Wallace says 63. †Wallace says 77.

dallah at the fair of the American Institute, in New York, and, after the fair, to take their colts—three and four years old, respectively,—for a light training for a few weeks. The program was carried out, and, after reaching the course, they started the two colts together and, much to Mr. Roe's surprise, Hambletonian beat his colt in 3.03. In a short time, Roe gave his colt another trial in 2.55½. A few days later, Rysdyk drove his colt in 2.48. Believing that he had the making of the best trotter in the world, and being thoroughly homesick, he packed his traps and started for Orange county, and this was the first and last training that Hambletonian ever had."

Hambletonian 10 matured early, and at three years of age seemed almost mature. His service in the stud began early, and, as it is remarkable, the most reliable estimate is here given in tabular form to the left.

According to this estimate, he covered 1,930 mares and got 1,333 colts, or an average of 69 per cent during his twenty-four years of service. He was sick one year. The peculiar thing is that of these 1,333 offsprings only forty ever became standard performers, but the sires among these forty performers were great sires of speed, as is shown in the table below, which gives a tabular list of all the sires that have one hundred or more standard performers to their credit, their male ancestry and the exact number of standard performers up to and including the season of 1907. A study of the table shows the wonderful power of Hambletonian 10 as a progenitor of speed, for of all the sires that have one hundred or more standard performers to their credit, there is but one, Elyria 5729, that does not trace directly to Hambletonian 10 by either its sire, grand sire, or great grand sire. No other horse of any blood or breed, of any time or period, in this or any other country, can show a record equal to this.

Justin Morgan. (Fig. 34.)

Justin Morgan, the founder of the Morgan family of horses, derived his name from Mr. Justin Morgan, who at one time owned him. The early history of this horse is not well known. Little or no interest was taken in him till after his death, and then facts were hard to procure. In many cases the stories are so conflicting that we are left completely at sea. It does not seem to be definitely

Name of horse	No. of standard performers	Pedigree
1. Onward 1411	198	George Wilkes 519—Hambletonian 10.
2. Gambetta Wilkes 4659	197	George Wilkes 519—Hambletonian 10.
3. Red Wilkes 1749	177	George Wilkes 519—Hambletonian 10.
4. Allerton 5128	176	Jay Bird 5060—George Wilkes 519—Hambletonian 10.
5. Nutwood 600	174	Belmont 64—Abdallah 15—Hambletonian 10.
6. Alcemtara 729	168	George Wilkes 519—Hambletonian 10.
7. Electioneer 125	160	Hambletonian 10.
8. Simmons 2744	137	George Wilkes 519—Hambletonian 10.
9. Baron Wilkes 4758	136	George Wilkes 519—Hambletonian 10.
10. Wilton 5982	135	George Wilkes 519—Hambletonian 10.
11. Ashland Wilkes 2291	126	Red Wilkes 1749—George Wilkes 519—Hambletonian 10.
12. Pilot Medium 1597	126	Happy Medium 400—Hambletonian 10.
13. Sphinx 5343	120	Electioneer 125—Hambletonian 10.
14. Jay Bird 5060	118	George Wilkes 519—Hambletonian 10.
15. Axtell Jr. 5183	114	William L 4244—George Wilkes 519—Hambletonian 10.
16. Robert McGregor 647	111	Major Edsall 216—Abdallah 15—Hambletonian 10.
17. Sidney 4770	110	Santa Claus 2000—Strathmore 408—Hambletonian 10.
18. Elyria 5729	107	Mambrino King 1279—Mambrino Patchen 58—Mambrino Chief 11.
19. Chimes 5348	106	Electioneer 125—Hambletonian 10.
20. Norval 5335	106	Electioneer 125—Hambletonian 10.
21. Wilkes Boy 3803	102	George Wilkes 519—Hambletonian 10.

known whether he was foaled in Massachusetts or Vermont. The date of foaling does not seem to be definitely known. Some writers give it as early as 1789, others as late as 1793. All seem to agree that his sire was True Briton or Beautiful Bay, and that his dam was of Wild-air breeding. Beyond this, all is speculation. Much has been written on the probable ancestry of True Briton, some persons asserting Canadian origin for him, some that he came from Connecticut, and the latest opinion seems to be that he was imported. It is now asserted that "James De Lancey was the original owner of True Briton, a horse which was one of his importations from England. He was a bright bay, about fifteen hands high, very active, and as gentle as he was active."

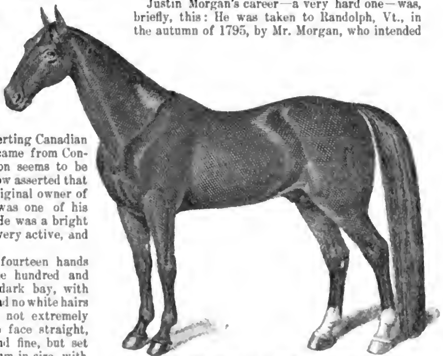

Fig. 33. **Hambletonian 10, or Rysdyk's Hambletonian.**

Justin Morgan was about fourteen hands high and weighed about nine hundred and fifty pounds. His color was dark bay, with black legs, mane and tail. He had no white hairs on him. His head was good, not extremely small, but lean and long, the face straight, forehead broad, ears small and fine, but set rather wide apart; eyes medium in size, with a spirited but pleasant expression; nostrils very large, lips close and fine; back rather short, shoulders and rump long and oblique, and the loins exceeding broad and muscular. He was rather close ribbed, with chest wide and deep. His legs were short, close-jointed, thin, but wide apart, well muscled and large for a horse of his size. His hair was short, soft and glossy. He was a very fast walker. In trotting, his gait was low and smooth, and his step short and nervous. While smooth in action, he was not rapid, and it is doubted whether he could trot a mile in four minutes. He was proud, bold and fearless in his movements, and his vigor and untiring action have perhaps never been surpassed.

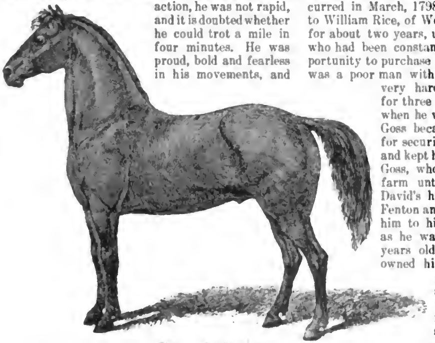

Fig. 34. **Justin Morgan.**

Justin Morgan's career—a very hard one—was, briefly, this: He was taken to Randolph, Vt., in the autumn of 1795, by Mr. Morgan, who intended to apply him to the payment of a note, but, not being able to obtain a reasonable price, and having no keep for him, he let him to a man named Robert Evans for one year, for the sum of fifteen dollars. While in Evans' care, he was put to hard work, though well cared for, and many are the stories told of how he outdid all the other horses in the neighborhood. He was much used as a saddle-horse. After Mr. Morgan's death, which occurred in March, 1798, he was sold by the estate to William Rice, of Woodstock, Vt. Rice used him for about two years, until 1801, when Mr. Evans, who had been constantly on the watch for an opportunity to purchase him, bought him. Mr. Evans was a poor man with a large family, and was a very hard worker. Evans kept him for three or four years, or until 1804, when he was sold for debt. Col. John Goss became his bail, took his horse for security, and finally paid the debt and kept him. Soon he passed to David Goss, who kept him at work on his farm until 1811. It was while in David's hands that he sired Hawkins, Fenton and Sherman. David Goss sold him to his son, Phillip, in 1811, and as he was now said to be nineteen years old, it seems that those who owned him were generally eager to get rid of him, for fear he should die on their hands. It was about this time that Bullrush was sired. Phillip Goss sold him to Sanderson, who sold him to Langmade, in whose charge he was worked down very thin, when he was purchased by Mr. Chelsea, for a trifle. Soon he passed to Joel Goss, of Claremont, N. H. A year later, Mr. Samuel Stone, of Randolph, purchased him. Mr. Stone kept him two or three years, until 1819, when he sold him, and he soon after became the property of Levi Bean, who owned him until his death, which occurred in the winter of 1821. He was not stabled, but was running loose in an open yard with other horses. He received a kick in the flank from one of them, and, being exposed without shelter to the inclemency of a northern winter, inflammation set in, and he died. Before receiving the injury which caused his death, he was perfectly sound and entirely free from any blemish. Mr. Lindsay asserts that he was twenty-nine years of age.

The history of Justin Morgan has been given somewhat in detail in order to show that he did not have much of a stud career. He is often credited with only four male offsprings that were left entire — Bulrush, Sherman, Woodbury and Revenger. This, of course, can not be proved. There seem to have been at least two more recorded in history—Fenton and Hawkins—although no horses of note trace to either of them. Between these stallions there was a very close and striking resemblance in size, form and general character, and they also bore equal resemblance to their sire. The power of transmitting his own form, constitution and temper was a very distinguishing trait of Justin Morgan.

Sherman was bred by Mr. James Sherman, of Lyndon, Vt. The exact date of his birth is not known, but it was between 1808 and 1811. But little is known of his dam. She was a "Chestnut of good size, high spirit, and an elegant animal." Sherman was a bright chestnut, about 13¾ hands high and weighed 925 pounds. His off hind-leg was white from the hoof half-way to the hock, and he had a small white stripe in the face. His shoulders were large and well placed, neck excellent, his mane and tail full. His hips were long and deep, his loins broad and muscular. He was a little hollow backed, yet no suspicion of a weak back could be attached to him. When four years old, Mr. Sherman put him to hard work. Mr. Sherman was a hard-working man, and animals under his charge had few opportunities to rest. Mr. Sherman kept him till 1819, when he sold him to Stephen C. Gibbs, of Littleton, N. H. He stayed here three years, when he was taken to Danville, Vt., by John Buckminster. He was kept in Danville and vicinity till 1829, when he was taken to Lancaster, N. H., by John Bellows. In 1830, he was kept at Dover and vicinity; in 1831, at Charlestown, Mass.; in 1832, at Dover and Durham, N. H.; in 1833, at Lancaster; in 1834, at Dover. He died at Lancaster, January 9, 1835, cause unknown.

Woodbury, sometimes called the Burbank horse, sometimes the Walker horse, was foaled the latter part of May, 1816. He was the property of Mr. Lyman Wright, of Tunbridge, Vt. Of the blood of his dam little is known. Woodbury was 14¾ hands high and weighed about 1,000 pounds. He was a dark, rich chestnut, his off hind-leg was white from hoof half-way to hock, and he had a white stripe in the face. He was close and compactly built, with heavy quarters and deep flanks, chest good and shoulders finely shaped. He had a short back and broad loins. His style of action was bold and resolute. He was a good driver and appeared well in harness.

Bulrush was foaled in 1812 or 1813. The blood of the dam is unknown. She was a dark bay, with black legs. She was low and compact. She was owned by Moses Belknap, of Randolph, Vt., at the time Bulrush was sired. Bulrush was a dark bay, with a few white hairs in his forehead and no other marks. His mane, legs and tail were black. His back was not so short as either Woodbury or Sherman, but it was very broad. His hips were very good, but not so long as Sherman's, and he was not so well quartered as Woodbury. He was proud, bold and lofty in his carriage. His most remarkable characteristic was his power of endurance. At that time he was generally admitted to have no rival. Mr. Belknap kept Bulrush in Tunbridge and vicinity until 1819, when he sold him to Abel Densmore, of Chelsea, Vt. Mr. Densmore sold him to Darius Sprague, of Randolph, Vt., who sold him March 8, 1826, to Messrs. Simon Smith and William Walker, of Hartland, Vt., for $350. They kept him in Hartland and vicinity until 1829, when Mr. Smith took him to Maidstone, Vt. The latter kept him one year in Chelsea and two years in the state of Maine, and in 1833 sold him to Jesse Johnson and Bros., of Bradford, Vt., where he spent the season of 1833. In 1834, he was kept at Keene, N. H.; in 1835, at Lyme, N. H., and Bradford, Vt.; the season of 1836, at Burlington; from 1837 to 1842, at Fairlee, Vt., and vicinity; then he passed to F. A. Weir, of Walpole, N. H., who kept him till his death, in 1848.

The writer has dwelt at some length on Morgan and his descendents in order to show clearly that they were much handicaped breeders in that they were in the hands of men not able to make the most of their home stock, and as a contrast with those breeders that were accorded every opportunity possible, such as the Standardbred trotters and the Percherons.

Louis Napoleon, Normandy and Success.

Louis Napoleon.—The popularity of the Percheron draft horse in America is due more, perhaps, to Louis Napoleon and his get than to any other single animal, although he was not the first of his breed brought to America. Two rather noted French horses antedated him — the "McNitt horse," said to have been imported in 1816, but about whom there seems to be much mystery, and "Diligence," imported in 1831. The latter is said to have had a very successful career, and left an impress on the horse stock of New Jersey and eastern Pennsylvania.

It was left, however, for Louis Napoleon—the first "Percheron Norman" or Percheron horse ever brought west of the Alleghanies — to create the movement for heavy-horse breeding on this continent. In the spring of 1851, Messrs. Charles Fullington and Erastus Martin, of Union county, Ohio, were traveling in Europe in quest of fine cattle and sheep for the Darby Plains Importing Company, when they were impressed with the wonderful powers and endurance manifested by the horses of Normandy and La Perche, when moving at a rapid gait with a heavy load. They were so highly pleased that they determined to bring a stallion home on their own account to try the effect of a cross on the stock of Ohio. Accordingly, they chose a grey three-year-old colt of good size, 15½ hands high, weighing, in full flesh, about 1,600 pounds. He was short-legged, closely ribbed and compact. At the time of his purchase he was a dark iron-grey, but long before his death he became perfectly white. They brought the colt to America under the name Louis Napoleon. This "chunky," short-legged grey colt and his importers became the laughing stock of Union county. He looked odd in contrast with the native stock. Mr. Fullington believed in him, and kept him in Union county during the season of 1852. His service fee was fixed at $10 to insure, yet such was the prejudice against him that only ten mares were bred to him, and seven of these belonged to his owners. In the spring of 1853, it was thought best to try a new field, and Louis Napoleon was sent to Dayton and his service fee fixed at $15, but he did little better than in Union county the previous year. In the meantime, the few colts he got in 1852 began to show signs of remarkable excellence, which was soon destined to make the much-despised French horse famous throughout the entire West. He was returned to Union county, Ohio, where he made the season of 1854, the service fee being fixed at $15, a very high price for that time. He was much in demand. In the autumn of this year, A. P. Cushman, of DeWitt county, Ill., became favorably impressed with him and the wonderful uniformity of his colts, and determined to take him to Illinois. This he did, but not until he had paid Mr. Fullington and his new partner, Mr. Gordon, $1,500 as the consideration.

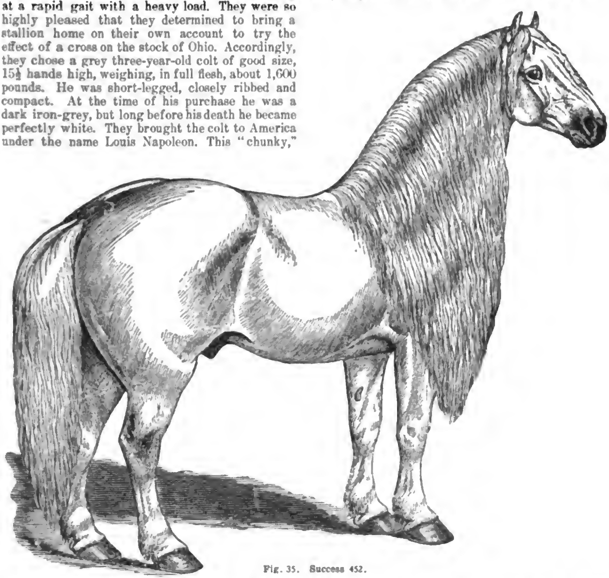

Fig. 35. Success 452.

Louis Napoleon remained in Mr. Cushman's hands until 1858, spending the season of 1855 in De Witt county, the next year in Woodford county, and the following season in Tazewell county. In 1858 he was purchased by the Messrs. Dillon, and by them kept at Boynton, Tazewell county, up to 1864, when he was taken to Bloomington, McLean county. He remained here until 1866. In this year he contracted a disease that resulted in his withdrawal from the stud for several years. Later, he stood several seasons at Attana, Ill., in the care of Eli Hodgson. The last year of his life he was kept at B. Caldwell's stable in Woodford county. During his last season he got only three foals. He died August 3, 1871.

Normandy.—During the same year (1851) that Messrs. Fullington and Martin purchased Louis Napoleon, Mr. Marcus Brown, a physician of Circleville, Ohio, while traveling in Europe, also became impressed with the superiority of the horses of La Perche, and decided to bring one home with him. The one that he chose, although a three-year-old, was not so large as Louis Napoleon, being only about 15½ hands high and weighing not over 1,500 pounds. He was kept for service near Circleville, Ohio, until the season of 1856, when he was taken to Madison county, Ohio, where he remained until his death, which occurred in the autumn of 1872.

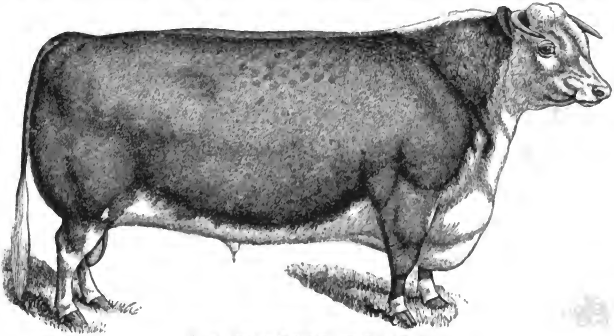
Fig. 36. **Imported Hereford bull, Success 2d (5031).**

Normandy, often called "Old Bill" or "The Valley Horse," contributed more to the popularity of the Percheron horse in central Ohio than any other. He was a sure foal-getter and is known to have been prolific. His get were remarkable for their uniformity, none being very large, but all of them large enough for good general-purpose horses. Mr. Jones, one of his owners, writes, "it is safe to say that he averaged sixty colts a year for eighteen years, and that they sold, at three and four years old, for an average price of $200; many of them having brought $500 each, and some as much as $1,000.

Success.—The crossing of the large French horse on our native stock being no longer an experiment, many French horses were imported. The horse, Success, which did much to increase the popularity in Illinois, was imported by W. J. Edwards, of Clifton, Iriquois county, in 1868, who soon sold him to the Fletcher Horse Company, of which M. W. Dunham was an active member. He stood about 16 hands high and weighed almost 1,600 pounds. In the stud he well deserved his name. His get were usually large, compact, clean-limbed and very stylish, as was also the horse himself (Fig. 35). In 1874, M. W. Dunham purchased the Fletcher Horse Company, and with it the horse Success. Dunham writes, "the average age at which the get of Success have been sold is two years and eight months, and the average price $450 per head, and during the year 1874 alone the sales of his get amounted to $36,000."

Success 2d (5031). (Fig. 36.)

The Hereford bull, Success 2d, was bred by J. Morris, of Town House, Madley, Herefordshire, England. He was calved February 12, 1873. His color was red, with white face. His pedigree is as follows: Got by Banquo (3667), dam (Dolly Varden) by Stow (3478), g.d. (Spangle) by Interest (2046), g.g.d. (Pleasant 2d) by Little Tommy (985), g.g.g.d. (Pleasant) by Greengage (1266).

About the time, or soon after the birth of Success 2d (5031), T. L. Miller, of Beecher, Illinois, became interested in Hereford cattle. He was a man of wealth and ability, and was instrumental in introducing Herefords into the West. He insisted that the public must recognize the merits of the breed for the range country. He made many importations, and exhibited at state fairs. In 1877, his cattle attracted the attention of C. M. Culbertson, of Illinois, and Adams Earl, Moses Fouller and W. S. Van Natta, of Indiana, all of whom became noted breeders and importers. In 1879, Culbertson imported thirteen head, and in 1880, over one hundred of the choicest quality and breeding. Among T. L. Miller's first importations was the Hereford bull, Success 2d (5031). He proved a very successful breeder, and was used at the head of Mr.

Miller's herd for many years. It was largely due to the attractiveness of this bull and his get that the men mentioned above became interested in Hereford cattle. The following tables for 1876, 1877 and 1879, taken from the records of the Illinois State Fair, will give an idea of the popularity and attractiveness of Success 2d. Only those classes are given in which Success 2d or his relatives appear. The records for 1878, equally interesting, are here omitted.

ILLINOIS STATE FAIR

1876

Bull, 3 years old.—First premium, Success 2d.

Bull, 2 years old.—First premium, Royal Briton 882, half-brother of Success 2d.

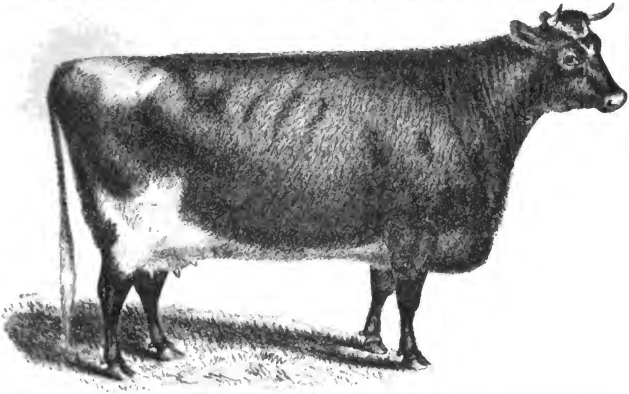

Fig. 37. 8th Duchess of Geneva, at three years old.

Bull calf, over 6 months. —First premium, Seward 906, by Success 2d. Second premium, Uncle Sam 934, half-brother to Success 2d.

Bull calf, under 6 months.—Second premium, Prince 2d 862, by Success 2d.

Cows, 4 years or over.—First premium, Dolly Varden 5, dam of Success 2d.

Heifer, 1 year old.—First premium, Prairie Flower 1159, by Success 2d. Second premium, Mary Hughs 1149, by Success 2d.

Heifer calf, over 6 months.—First premium, Peerless 1157, by Success 2d. Second premium, Eugenia 1130, by Success 2d.

Heifer calf, under 6 months.—First premium, Maid of Honor 1145, by Success 2d. Second premium, Miss Humphries, by Success 2d.

1877

Bulls, 4 years old and over.—First Premium, Success 2d.

Bull, 1 month old.—First Premium to T. L. Miller.[1]

Bull calf, over 6 months.—First and second premiums to T. L. Miller.[1]

Bull calf, under 6 months.—First and second premiums to T. L. Miller.[1]

Heifer, 2 years old.—First and second premiums to T. L. Miller.[1]

Heifer, 1 year old.—First and second premiums to T. L. Miller.[1]

Best heifer calf, over 6 months.—First and second premiums to T. L. Miller.[1]

Best bull of any age, 8 entries.—Sweepstakes to Success 2d.

Best 5 calves of any breed, male or female, under 1 year and owned by one man or firm, 8 entries.—Second premium to T. L. Miller on Success 2d calves.

Best 5 cattle, male or female, of any age, without regard to ownership, the get of one bull, the sire to be shown with the herd and considered in making the award 8 entries.—First to L. T. Miller on Success 2d and 5 of his female get.

1879

Bull, 3 years old or over.—First premium, Success 2d.

Cow, 4 years old or over.—First premium, Prairie Flower 1159, by Success 2d.

Heifer, 2 years old.—First premium, Highland Queen 1161, by Success 2d.

Heifer calf, over 6 months.—First premium, Miss Filley, by Success 2d.

Best cow or heifer, any age, 8 entries.—Highland Queen 1141, by Success 2d.

It was this sort of winning that attracted the attention of the public to the Herefords in this country, and we note the important part played by Success 2d.

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[1] Animals not given, but since Success 2d was at the head of the herd it is fair to assume that he sired many of them.

8th Duchess of Geneva. (Fig. 37.)

The renowned Shorthorn cow, 8th Duchess of Geneva, was bred by James O. Sheldon, of Geneva, N. Y. She was calved July 28, 1866. Her color was red and white. Her pedigree is as follows: Got by 3d Lord of Oxford 4958 out of Duchess of Geneva, by 2d Grand Duke 2181; g.d. Duchess 71st by Duke of Gloster 2763; g.g.d. Duchess 66th by 4th Duke of York 10167.

The notoriety of this Shorthorn cow rests on the simple fact she sold for more money than any other individual of the cow kind. This high price was due, not to individual merit, but to the fact that there seemed to be a "corner" on the Duchess family, and an enormous sum was paid in order to break it.

The real cause of the excitement which led to the purchase of this cow dates back at least to the summer of 1852, when, at the executive sale of the estate and herd of Earl Dulcie, of England, Messrs. Morris, Becar and Thorne purchased four Duchess cows at a cost of $10,237—Duchess 66th, $3,675; Duchess 59th, $1,837; Duchess 64th, $3,150, and Duchess 68th, at $1,575. The passage to America was very stormy, and Duchess 68th was lost. Of the three landed, Duchess 66th was the only one leaving female descendants. In 1854, Mr. Becar died and his interest in the herd, including Duchess 66th, fell into the hands of his partner, Colonel Morris. In 1857, Colonel Morris sold his entire herd to Mr. Thorne. Later, Mr. Thorne sold part of his herd to Mr. Sheldon, and in 1867, sold the remainder—forty head, including the Duchess—at $42,300, to the same party. In 1870, Mr. Sheldon disposed of his entire herd to Messrs. Walcott and Campbell, of New York Mills, near Utica, N. Y. A year later, Mr. Walcott disposed of his interests to his partner, Samuel Campbell, who became the sole owner of the herd. The latter determined to dispose of the entire herd, and this sale was largely advertised, especially in England, to take place September 10, 1873, at New York Mills, near Utica, N. Y. What happened on that eventful day has often been told. The cow, 8th Duchess of Geneva, at that time over seven years old, and having produced nearly the full quota of calves which she could be expected to produce, sold for $40,600, the highest price ever paid for an animal of the bovine kind. No one thought she would sell for as much as the 10th Duchess, and Mr. Kello doubtless thought he would get her at his first bid of $10,000. Mr. Kello bought her for Mr. Davies of England. He made an error in estimating American currency. Mr. Campbell wrote Mr. Morris, stating the facts, and asked him to place a bid on the cow, and he agreed to take her at $30,600, the price brought by her daughter. Meanwhile, Davies was forming a syndicate in England and took the cow at the $40,600, and finally cabled "Don't sell the cow, have arranged to take her." This arrived too late as the trade with Colonel Morris had been closed. As the cow was in calf, she was left at Mr. Campbell's farm until parturition should take place. A few days before her time, she dropped a fully-developed dead heifer calf, and soon thereafter died herself, every effort to save her proving fruitless. Mr. Davies then sent a bill of exchange for $5,000 to Mr. Campbell, which was turned over to Colonel Morris, thus alleviating, to that extent, his lamentable loss. It is said that Colonel Morris had no intention of buying cattle when he went to the sale, but did so at the remark of a friend, to save the day for the Duchess in America.

CURRENT AGRICULTURAL JOURNALS

The number of agricultural periodicals in existence at any one time in North America is surprisingly large, even after eliminating those that are agricultural chiefly only in name. The history of agricultural journalism in this country is also more complex and of earlier origin than most persons are aware. The history is difficult to follow, also, because the same name is sometimes used at different times for wholly different journals, from the practice of dating back to a former publication of the same name but which may not have been an ancestor, and from change of name in the same periodical.

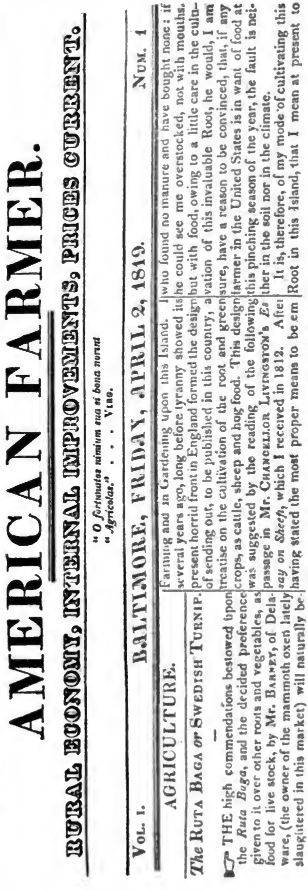
The Massachusetts Agricultural Repository and Journal of the Massachusetts Society for Promoting Agriculture was apparently established in 1793. This, however, was an occasional organ of a society, devoted largely to the collection of information, and was not an agricultural journal in the present sense of the term. Agricultural journalism in North America is usually dated from April 2, 1819, when John S. Skinner (see page 611) established the American Farmer in Baltimore. This was an eight-page weekly. It continued until about 1862. On June 5, 1819, The Plough Boy appeared at Albany, edited by Solomon Southwick under the pen name of Henry Homespun, Jr. The paper continued for twenty years or more. The first New England Farmer appeared in Boston, August 3, 1822, and continued till June 24, 1846. The first New York Farmer appeared in New York City about 1827, and continued for several years. The Southern Agriculturist was first issued in 1828 at Charleston, S. C., by J. D. Legare (Cf. page 376), and continued till 1842 or later. On January 1, 1831, the Genesee Farmer was established at Rochester by Luther Tucker (see page 622). In March, 1834, the Cultivator was founded at Albany by Jesse Buel (Cf. pages 380, 383). On the death of Judge Buel in 1839, the paper was purchased by Luther Tucker who united with it the Genesee Farmer, and this paper ceased to exist, although another Genesee Farmer subsequently appeared in Rochester. The Cultivator was continued as a monthly. January 1, 1853, Mr. Tucker established the Country Gentleman as a weekly, and the two papers were merged in 1866. This periodical still continues.

Following, is a partial list of agricultural journals established before 1850, many of which still survive: Northern Farmer, Newport, N. H., July 7, 1832; Farmers' Register, Richmond, Va., June, 1833; Kennebec Farmer (later the Maine Farmer), 1833, by Ezekiel Holmes (see page 365); Tennessee Farmer, Jonesborough, December, 1834; Farmer's Cabinet, Philadelphia, 1836; Farmer's Monthly Visitor, Concord, N. H., January 15, 1839; Boston Cultivator, later the American Cultivator, 1839; Western Farmer, Cincinnati, September, 1839; the first Southern Cultivator, Columbia, Tenn., 1839; Southern Cabinet of Agriculture, Charleston, S. C., January, 1840; Agriculturist, Nashville, Tenn., January, 1840; Prairie Farmer, Chicago, 1840; Massachusetts Ploughman, 1841; Southern Planter, Richmond, 1841; American Agriculturist, 1842, by A. B. Allen and R. L. Allen; Central New York Farmer, Rome, N. Y., January, 1842; Southern Cultivator, at Augusta, 1843; first Michigan Farmer, 1843; the second New York Farmer, 1844; Ohio Cultivator, Columbus, January 1, 1845; Quarterly Journal of Agriculture, Albany, January, 1845; Monthly Journal of Agriculture, New York, July, 1845; Indiana Farmer, 1845; Colman's Rural World, in 1848 as the Valley Farmer; the second New England Farmer in 1848; Working Farmer, New York, 1849; Northwestern Cultivator, Madison, Wis., 1849.

A number of papers were established in 1850, one of them being the Rural New Yorker; and from that time on the development of agricultural journalism has been rapid. Independent horticultural journalism began in 1835 with the Horticultural Register, Boston (see Cyclopedia of American Horticulture, 769). The American Silk Grower, "a new monthly publication," appeared in Burlington, N. J., in 1838; Fessenden's Practical Farmer and Silk Manual in Boston in 1835 (Cf. Bailey, Evolution of Our Native Fruits). Other special journals appeared very early.

The following list comprises all the agricultural journals known by the Editor to be current at the present date in the United States and Canada. The word agriculture is interpreted broadly to mean general farming, fruit-growing, vegetable-gardening, floriculture, bee-keeping, forestry, stock-raising, and similar subjects. Journals devoted to popular natural history, the out-of-doors, and to sports, have been omitted; also those, whatever their name, in which the agricultural part is thought to occupy only a subordinate position. The list was compiled from Batten's Agricultural Directory, 1908, Rowell's American Newspaper Directory, 1907, and Floyd's Trade Press List, August, 1907, and proofs of the list have been submitted to all the papers now entered in the list.

The object of publishing the list is to bring together in one place as complete a record as possible of the journal literature of American agriculture of the present day. So far as possible, six pieces of information are given under each entry: Name of the journal; editor or publisher; frequency of issue (*M.* standing for monthly, *W.* for weekly, *S-M.* for semi-monthly, *B-W.* for bi-weekly, *Q.* for quarterly); subscrip-



AMERICAN FARMER.

RURAL ECONOMY, INTERNAL IMPROVEMENTS, PRICES CURRENT.

" *O fortunatos nimium sua si bona norint*
" *Agricolas.*" . . . VIRG.

VOL. I. BALTIMORE, FRIDAY, APRIL 2, 1819. NUM. 1

AGRICULTURE.

The RUTA BAGA *or* SWEDISH TURNIP.

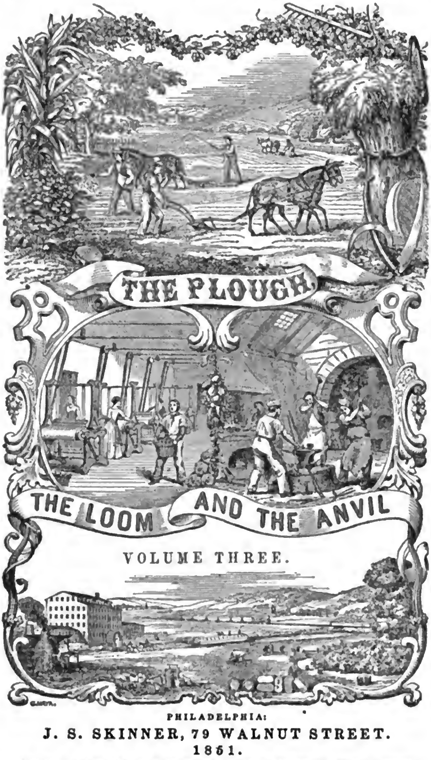
THE high commendations bestowed upon the *Ruta Baga*, and the decided preference given to it over other roots and vegetables, as food for live stock, by Mr. BARNEY, of Delaware, (the owner of the mammoth oxen lately slaughtered in this market) will naturally be-

Farming and in Gardening upon this Island. I several years ago, long before tyranny showed its present horrid front in England formed the design of sending out, to be published in this country, a treatise on the cultivation of the root and green crops, as cattle, sheep and hog food. This design was suggested by the reading of the following passage in Mr. CHANCELLOR LIVINGSTON'S *Essay on Sheep*, which I received in 1812. After having stated the most proper means to be em-

who found no manure and have bought none: if he could see me overstocked, not with mouths, but with food, owing to a little care in the cultivation of this invaluable Root, he would, I am sure, have a reason to be convinced, that, if any farmer in the United States is in want of food at this pinching season of the year, the fault is neither in the soil nor in the climate.

It is, therefore, of my mode of cultivating this Root in this Island, that I mean at present to

Fig. 38. Facsimile of the first North American agricultural periodical.



THE PLOUGH

THE LOOM AND THE ANVIL

VOLUME THREE.

PHILADELPHIA:

J. S. SKINNER, 79 WALNUT STREET.

1851.

Fig. 39. Title-page of one of the early magazine-like periodicals. Slightly reduced.

tion price; date of establishment as reckoned by the journal itself; place of publication.

I. In Canada

Acadian Orchardist. H. G. Harris, ed. and pub. *W.* $1. 1873. Kentville, N. S.

Canadian Bee Journal. James J. Harley. *M.* $1. 1884. Brantford, Ont.

Canadian Dairyman and Farming World. Rural Publishing Company. *W.* $1. 1881. Peterborough, Ont.

Canadian Entomologist. Rev. C. J. S. Bethune. *M.* $1. 1868. Guelph, Ont.

Canadian Florist. A. B. Cutting. *B-W.* $1. 1905. Peterborough, Ont.

Canadian Forestry Journal. Canadian Forestry Association. *Q.* $1. 1905. Ottawa, Ont.

Canadian Horticulturist. A. B. Cutting. *M.* 60 cents. 1878. Peterborough, Ont.

Canadian Life and Resources. W. B. S. Smith. *M.* $1. Montreal, Quebec.

Canadian Pigeon Fancier. Kedwell and Company. *M.* 50 cents. 1903. Petrolia, Ont.

Canadian Poultry News. Canadian Poultry News Company. *M.* 50 cents. 1898. Owen Sound, Ont.

Canadian Poultry Review. H. B. Donovan, ed. and pub. *M.* 50 cents. 1877. Toronto, Ont.

Canadian Sportsman and Live Stock Journal. E. King Dodds. *W.* $2. 1870. Toronto, Ont.

Canadian Thresherman and Farmer. E. H. Heath Company, Ltd. *M.* 50 cents. 1902. Winnipeg, Man.

Courier and Okanagan Orchardist. Geo. C. Rose, ed. and pub. *W.* $1.50. 1904. Kelowna, B. C.

Farm and Ranch Review. F. S. Wetherall. *M.* $1. 1905. Calgary, Alb.

Farmer's Advocate and Home Journal. The Farmer's Advocate of Winnipeg, Ltd. *W.* $1.50. 1866. Winnipeg.

Farmer's Advocate and Home Magazine. Wm. Weld Company. *W.* $1.50. 1866. London, Ont.

Farm Crops. J. D. Dothie. *M.* 50 cts. 1905. Winnipeg.

Fruit Grower, Market Gardener and Poultryman. James A. Livingston. *W.* $1. 1907. Grimsby, Ont.

Gazette Des Campagnes. Formin H. Proulx. *W.* $1. 1861. Montreal, Quebec.

Gold Hunter and Farmer's Journal. W. H. Banks, ed. and pub. *W.* $1.50. 1888. Caledonia, N. S.

Great West. J.H.Thames. *S-M.* $1. 1907. Edmonton, Alb.

Homestead. Herald Printing and Publishing Company. *S-W.* $1. 1901. Halifax, N. S.

Island Farmer. A. D. Branscombe. *W.* $1. 1887. Summerside, Prince Edward Island.

Le Journal D'Agriculture et D'Horticulture. *M.* $1. 1879. Quebec, Que.

Maritime Farmer. R. D. Robinson, Publisher, Ltd. *S-M.* $1. 1895. Sussex, N. B.

Nor'-West Farmer. Nor'-West Farmer Company, Ltd. *S-M.* $1. 1882. Winnipeg, Man.

Ontario Agricultural College Review. H. H. Le Drew. *M.* $1. 1888. Guelph, Ont.

Oxford Tribune and Canada Dairy Reporter. E. L. Smith and Son, ed. and pub. *W.* $1. 1873. Ingersoll, Ont.

Poultry and Dogs. J. R. Cote, ed. and pub. *M.* 10 cents. 1906. Chatham, Ont.

Poultry, Garden and Home Advocate. H. B. Donovan. *M.* 50 cents. 1898. Toronto, Ont.

Prince Edward Island Agriculturist. W. A. Brennan. *W.* $1.25. 1876. Summerside, Prince Edward Island.

Times and Eastern Ontario Dairyman. A. T. Wilgress, ed. and pub. *W.* $1. 1882. Brockville, Ont.

Weekly Globe and Canada Farmer. Globe Printing Company. *W.* $1. 1844. Toronto, Ont.

II. In the United States

Acker und Gartenbau Zeitung. The Herold Company. *W.* $1. 1869. Milwaukee, Wis.

Agricultural Epitomist. Epitomist Publishing Company. *M.* 25 cents. 1881. Spencer, Ind.

Agricultural Herald. B. O. Bristow, ed. and pub. *M.* 50 cents. 1894. Darlington, S. C.

Agricultural Southwest. C. I. Reed Publishing Company. *W.* $1.50. 1904. (Consolidation of Southwestern Farmer [1895], Smith's Fruit Farmer [1891], American Horticulturalist [1895], Home Trade Advocate [1904], Railroad Bulletin [1904]). Witchita, Kans.

Agricultural Student Magazine. Agricultural Student Publishing Company. *M.* 50 cents. 1894. Columbus, Ohio.

Agriculture. University of Nebraska. *M.* $1. 1902. Lincoln, Neb.

Alabama Farmer. Rolfe S. Saunders. *M.* 25 cents. 1905. Montgomery, Ala.

American Agriculturist. Orange Judd Company. *W.* $1. 1842. New York, Springfield, Mass., and Chicago.

American Bee Journal. George W. York. *M.* 50 cents. 1861. Chicago, Ill.

American Cheesemaker. E. A. Stowe. *M.* 50 cents. 1886. Grand Rapids, Mich.

American Coöperative Journal. C. G. Messerole. *M.* $1. 1905. Chicago, Ill.

American Cultivator. W. G. James. *W.* $1. 1839. Boston, Mass.

American Fancier. L. W. Lott and H. M. Pockman. *W.* 50 cents. 1893. New York, N. Y.

American Fancier and Breeder. F. W. Munger. *M.* 25 cents. 1883. Dekalb, Ill.

American Farmer, Live Stock and Poultry Raiser. Solon L. Goode. *M.* 50 cents. 1884. Indianapolis, Ind.

American Farm Review. Leonard Darbyshire. *M.* 25 cents. 1908. Rochester, N. Y.

American Fertilizer. Ware Brothers Company. *M.* $2. 1894. Philadelphia, Pa.

American Florist. The American Florist Company, ed. and pub. *W.* $1. 1885. Chicago, Ill.

American Forest Review. J. Label. *M.* $1. 1898. San Francisco, Cal.

American Fruit and Nut Journal. H. Harold Hume. *M.* $1. 1904. Petersburg, Va.

American Fruits. H. C. Goodwin. *M.* $1. 1903. Rochester, N. Y.

American Homestead. D. M. Carr. *W.* $1. 1883. Omaha, Neb.

American Horse Breeder. T. L. Quimby, mgr. *W.* $2. 1882. Boston, Mass.

American Monthly Herald. A. W. Aurand, ed. and pub. *M.* 20 cents. 1896. Beaver Springs, Pa.

American Pigeon Keeper. J. C. Pratt. *S-M.* $1. 1896. Chicago, Ill.

American Poultry Advocate. Clarence C. De Puy, ed. and pub. *M.* 50 cents. 1892. Syracuse, N. Y.

American Poultry Journal. Geo. G. Bates. *M.* 50 cents. 1874. Chicago, Ill.

American Poultry Raiser. E. J. M. Leader, ed., and C. M. Parker, pub. *S-M.* 75 cents. 1885. Philadelphia, Pa.

American Sheep-breeder and Wool-grower. L. D. Burch. *M.* $1. 1881. Chicago, Ill.

American Stock Farm and Advance Farmer. J. H. Johnston. *M.* 50 cents. 1880. Winona, Minn.

American Stock Keeper. W. B. Atherton. *W.* $1. 1888. Boston, Mass.

American Stockman. G M. Bishop. *W.* $1. 1900. Kansas City, Mo.

American Sugar Industry and Beet Sugar Gazette. The Beet Sugar Gazette Company, Frank Roderus, pub. *M.* $2. 1899. Chicago, Ill.

American Swineherd. James Baynes & Son, ed. and pub. *M.* 50 cents. 1885. Chicago Ill.

American Thresherman. B. B. Clarke. *M.* $1. Madison, Wis.

Apple Specialist. James McKinnay. *M.* 50 cents. 1903. Quincy, Ill.

Arboriculture. John P. Brown, ed. and pub. *B-M.* $1. 1902. Connersville, Ind.

Arkansas Homestead. S. L. Kay, ed. and pub. *M.* 50 cents. 1900. Little Rock, Ark.

Arkansas Magnet. M. L. Tucker, ed. and pub. *W.* $1 1898. Paris, Ark.

Atlantic States Agriculturist and Patron of Husbandry. Farm-Garden and Poultry Publishing Company. *M.* 50 cents. Philadelphia, Pa.

Banner Stockman. John E. Cooke, ed. and pub. *W.* $1.50. 1892. Clarendon, Texas.

Barnum's Midland Farmer. W. M. Barnum. *S-M.* 50 cents. 1898. St. Louis, Mo.

Beekeeper's Review. W. Z. Hutchinson, ed. and pub. *M.* $1. 1888. Flint, Mich.

Belle Fourche Bee. J. S. Smith. *W.* $2. 1889. Belle Fourche, S. D.

Better Fruit. E. H. Shepard. *M.* $1. 1906. Hood River, Ore.

Blooded Stock. C. E. Morrison. *M.* 50 cents. 1895. Oxford, Pa.

Bourbon Stock Journal. Wm. A. Burnett, ed. and pub. *S-M.* 50 cents. 1903. Louisville, Ky.

Breeder and Sportsman. D. L. Hackett and J. DeWitt. *W.* $3. 1882. San Francisco, Cal.

Breeder's Gazette. Sanders Publishing Company. *W.* $2. 1881. Chicago, Ill.

Breeders' Guide. E. C. Babcock, ed. and pub. *M.* 50 cents. 1907. Chicago, Ill.

Breeders Special. Breeders Special Publishing Company. *W.* $1.50. 1906. Kansas City, Mo.

Business Farmer. C. L. Sweet, ed. and pub. *M.* 50 cents. 1906. Keyser, W. Va.

California Agricultural Journal. S. C. Longwell, ed. and pub. *S-M.* 50 cents. 1902. Fresno, Cal.

California Cultivator. Cultivator Publishing Company. *W.* $1. 1889. San Francisco and Los Angeles, Cal.

California Fruit Grower. H. C. Rowley, ed. and pub. *W.* $2. 1888. San Francisco, Cal.

Campbell's Scientific Farmer. Campbell Soil Culture Company. *M.* $1. 1906. Lincoln, Neb.

Carolina Fruit and Trucker's Journal. Z. W. and W. S. Whitehead. *S-M.* $1. 1896. Wilmington, N. C.

Cattle Specialist. R. H. Williams. *M.* 50 cents. 1907. Waukesha, Wis.

Chicago Dairy Produce. George Caven. *W.* $1.50. 1893. Chicago, Ill.

Chicago Farmers' and Drovers' Journal. Drovers' Journal Publishing Company. *D.* $4. 1873. Chicago, Ill.

Chicago Live Stock World. Ashley C. Halliwell, ed. and pub. *D.* $3. 1899. Chicago, Ill.

Cleveland Live Stock News. C. E. Gibbons. *D.* $4. 1897 Cleveland Union Stock Yards, Cleveland, Ohio.

Colman's Rural World. Norman J. Colman. *W.* $1. 1848. St. Louis, Mo.

Colorado Fruit Grower. A. W. Davis, ed. and pub. *M.* 1905. $1. Grand Junction, Colo.

Commercial Poultry. J. F. Schnreman. *M.* 50 cents. 1901. Marseilles, Ill.

Connecticut Farmer. Geo. V. Smith. *W.* $1. 1854. New Haven, Conn.

Conservation. Frank Glover Heaton. *M.* $1. 1895. Washington, D. C.

Coöperative Journal. Greene Majors. *M.* 50 cents. 1900. Oakland, Cal.

Cornell Countryman. E. L. D. Seymour. *M.* 50 cents. 1903. Ithaca, N. Y.

Cotton and Cotton Oil News. M. T. Blackwell and associates. *W.* $2. 1900. Dallas, Texas.

Cotton. Cotton Publishing Company. *M.* $2. 1893. Atlanta, Ga.

Cotton Journal. Harvey Jordan. *W.* $1. 1906. Atlanta, Ga.

Cotton Record. Wm. T. Williams. *W.* $2.50. 1907. Savannah, Ga.

Cotton Seed Oil Magazine. H. E. Harman. *M.* $1. 1901. Atlanta, Ga.

Country Gentleman. Gilbert M. Tucker. $1.50. 1831. Albany, N. Y.

Country World. A. B. Fletcher, ed. and pub. *M.* 50 cents. 1898. Jamestown, N. Y.

Creamery Journal. E. R. Shoemaker. *M.* $1. 1890. Waterloo, Iowa.

Dairy Record. H. P. Olsen. *W.* $1. 1899. St. Paul, Minn.

Dakota Farmer. W. F. T. Bushnell Co. *S-M.* 60 cents. 1881. Aberdeen, S. D.

Delaware Farm and Home. Martin Hutchinson. *W.* 50 cents. 1885. Wilmington, Del.

Deseret Farmer. Lewis A. Merrill. *W.* $1. 1904. Salt Lake City, Utah.

Deutsch Amerikanischer Farmer. C. Landmann. *W.* $1. 1888. Lincoln, Neb.

Dixie Poultry Breeder. E. R. Farrell and W. D. Hastings. *M.* 50 cents. 1894. Columbia, Tenn.

Drovers' Journal-Stockman. Journal-Stockman Company. *D.* $4. 1887. South Omaha, Neb.

Drovers' Telegram. Drovers' Telegram Company. *D.* $4. 1884. Kansas City, Mo.

Duroc Bulletin. Duroc Printing and Publishing Company. *S-M.* 50 cents. 1904. Peoria, Ill.

Egg Reporter. E. R. Shoemaker. *M.* (*S-M.* in March, April, May, October, November, December.) $1.50. 1895. Waterloo, Iowa.

Elgin Dairy Report. W. C. Willson. W. $1. 1891. Elgin, Ill.

Fancy Fowls. Chas. M. Meacham. *M.* 25 cents. 1897. Hopkinsville, Ken.

Fancy Fruits. Granville Lowther, ed. and pub. *M.* $1. 1907. North Yakima, Wash.

Farm. J. H. Hackett. *S-W.* 50 cents. 1899. Jacksonville, Ill.

Farm and Dairy Herald. Otto Gaffron. *W.* $1.25. 1905. Plymouth, Wis.

Farm and Fireside. Crowell Publishing Company, New York, N. Y. *S-M.* 25 cents. 1877. (Eastern and western editions.) Springfield, Ohio.

Farm and Home. Phelps Publishing Company. *M.* 50 cents. 1880. Springfield, Mass.

Farm and Home Enterprise. J. G. Lehentaler, ed. and pub. *W.* $1. 1898. Norwalk, Ohio.

Farm and Ranch. Texas Farm and Ranch Publishing Company. *W.* $1. 1881. Dallas, Tex.

Farm and Stock. Farm and Stock Company. *M.* $1. 1906. St. Joseph, Mo.

Farm Economist. J. C. McManima, ed. and pub. 50 cents. 1897. Springfield, Mo.

Farmer. E. A. Webb. *S-M.* 50 cents. 1882. St. Paul, Minn.

Farmer. C. L. Smith. *S-M.* 50 cents. 1902. Spokane, Wash.

Farmer and Mechanic. N. & O. Publishing Company. *W.* $1. 1877. Raleigh, N. C.

Farmer and Stockman. The Farmer and Stockman Publishing Company. *W.* $1. 1878. Kansas City, Mo.

Farmer Herold (German). B. Reinhard. *W.* $1. 1905. St. Cloud, Minn.

Farmer's Advocate. Wallace E. Sherlock. *W.* $1. 1879. Topeka, Kans.

Farmers' and Drovers' Journal. C. A. McCraken and T. L. Wheeler. *D.* $4. 1873. Chicago, Ill.

Farmer's and Planter's Guide. Geo. O. Gover. *M.* 25 cents. 1864. Baltimore, Md.

Farmer's Call. J. M. Stahl and A. Otis Arnold. *W.* 40 cents. 1880. Quincy, Ill.

Farmers' Cotton Union News. Union Printing and Publishing Company. *W.* $1. 1904. Greenville, S. C.

Farmers' Digest. Farmers' Digest Company. *B-M.* $1. 1907. Columbia, Pa.

Farmer's Friend and Grange Bulletin. R. H. Thomas, Jr. *W.* 75 cents. 1873. Mechanicsburg, Pa.

Farmer's Guide. Ben. F. Biliter and H. E. Young. *W.* 75 cents. 1888. Huntington, Ind.

Farmer's Home Journal. M. W. Neal. *W.* $1. 1865. Louisville, Ken.

Farmer's Journal. J. L. Hicks, ed. and pub. *W.* 50 cents. 1904. Abilene, Tex.

Farmer's Mail and Breeze. T. A. McNeal. *W.* $1. 1870. Topeka, Kans.

Farmers' Record. Benjamin Fuelleman. *M.* 50 cents. 1907. Milwaukee, Wis.

Farmers' Review. E. W. Chandler. *W.* $1. 1878. Chicago.

Farmers' Success. E. C. Wainwright. *M.* 25 cents. 1906. Long Branch, N. J.

Farmers' Tribune. W. J. Murphy, ed. and pub *S-W.* $1. Minneapolis, Minn.

Farmers' Tribune. John Thompson and H. G. McMillan. *W.* $1. 1878. Sioux City, Iowa.

Farmers' Union Guide. B. D. Cather. *M.* $1. 1906. Birmingham, Ala.

Farmers' Union News. R. F. Duckworth. *W.* $1. 1903. Union City, Ga.

Farmer's Voice and Rural Outlook. H. A. Bereman. *S-M.* $1. 1864. Evanston and Chicago, Ill.

Farm-Garden and Poultry. Farm-Garden and Poultry Company. *M.* 50 cents. 1902. Hammonton, N. J.

Farm Gazette. Farm Gazette Company. *M.* 50 cents. 1904. Des Moines, Iowa.

Farm Home. Charles F. Mills, ed. and pub. *M.* 50 cents. 1893. Springfield, Ill.

Farm Journal. Wilmer Atkinson Company. *M.* 75 cents for 5 years. 1877. Philadelphia, Pa.

Farm Life. Farm Life Publishing Company, ed and pub. *M.* 25 cents. 1903. Chicago, Ill.

Farm Magazine. W. T. Laing. *S-M.* 25 cents. 1903. Omaha, Neb.

Farm Money-Maker. Burkam Publishing Company. *M.* 50 cents. 1903. Cincinnati, Ohio.

Farm News. Simmons Publishing Company. *M.* 25 cents. 1882. Springfield, Ohio.

Farm Poultry. Farm Poultry Publishing Company. *M.* 50 cents. 1889. Boston, Mass.

Farm Press. Farm Press Publishing Company. *M.* 25 cents. 1877. Chicago, Ill.

Farm Progress. Chas. W. Knapp. *S-M.* 25 cents 1904. St. Louis, Mo.

Farm Queen. J. S. Carrick, ed. and pub. *M.* 25 cents. 1905. Easton, Md.

Farm Star. W. B. Westlake. *S-M.* 50 cents. 1903. Indianapolis, Ind.

Farm Stock and Home. S. M. Owen. *S-M.* 50 cents. 1884. Minneapolis, Minn.

Farm Stock Success. A. D. Hosterman, pub. *M.* 50 cents. 1883. Springfield, Ohio.

Farm World. Jas. D. Salts. *M.* 50 cents. 1903. Bois D'Arc, Mo.

Feather. Geo. E. Howard, ed. and pub. *M.* 50 cents. 1895. Washington, D. C.

Feld and Flur. Feld and Flur Publishing Company. *M.* 50 cents. 1898. Dallas, Tex.

Field and Farm. Lute M. Wilcox. *W.* $2. 1885. Denver, Colo.

Floral Life. Young & Bennett Co. *M.* 25 cents. 1903. Springfield, Ohio.

Florida Agriculturist. W. C. Steele. *W.* $1. 1874. De Land, Fla.

Florida Poultry and Agricultural Journal. Frank S. Love. *M.* 50 cents. 1906. Tampa, Fla.

Florists' Exchange. A. T. De La Mare Printing and Publishing Company. *W.* $1. 1888. New York, N. Y.

Florists' Review. G. L. Grant. *W.* $1. 1897. Chicago, Ill.

Forest Leaves. John Birkinbine. *B-M.* $1. 1886. Philadelphia, Pa.

Fruit Belt. Geo. W. Welsh. *M.* 50 cents. 1905. Grand Rapids, Mich.

Fruitman and Gardener. M. E. Hinkley. *M.* 50 cents. 1897. Mount Vernon, Iowa.

Fruitman's Guide. J. C. Harney. *W.* $1. 1896. N. Y.

Fruit Grower. Jas. M. Irvine. *M.* $1. 1897. St. Joseph, Mo.

Fruit Growers' Journal. O. O. Buck, ed. and pub. *M.* 50 cents. 1883. Treynor, Iowa.

Fruit Trade Journal and Produce Record. Fruit Trade Journal Company. *W.* $1. 1889. New York, N. Y.

Game Fancier's Journal. Geo. S. Barnes, ed and pub. *M.* 50 cents. 1879. Battle Creek, Mich.

Gardener's Chronicle of America. Chronicle Press. *M.* $1. 1904. Jersey City, N. J.

Gardening. The Gardening Company, ed. and pub. *S-M.* $2. 1892. Chicago, Ill.

Garden Magazine and Farming. Wilhelm Miller. *M.* $1. 1903. New York, N. Y.

Gazeta Wisconsinika. Kuryer Publishing Company. *S-M.* $2. 1892. Milwaukee, Wis.

Geflügel Züchter (German). H. C. Voigt. *M.* 50 cents 1888. Hamburg, Wis.

Gem State Rural. A. E. Gipson. *M.* $1. 1895. Caldwell, Idaho.

Gleaner. G. H. Slocum. *M.* 25 cents. 1894. Detroit.

Gleanings in Bee Culture. A. I. Root. *S-M.* $1. 1873. Medina, Ohio.

Goodall's Farmer. Drover's Journal Publishing Company. *W.* 50 cents. 1873. Chicago, Ill.

Grain Grower's Journal. P. W. Sharp and C. R. Thatcher. 60 cents. *M.* 1906. Minot, N. D.

Green's Fruit Grower and Home Companion. Chas. A. Green. M. 50 cents. 1881. Rochester, N. Y.

Hacienda, La. La Hacienda Company. *M.* $3. 1905. Buffalo, N. Y.

Haus und Bauern-Freund. Hans Buschbauer. *W.* $1. 1873. Milwaukee, Wis.

Herd Register and Breeders Journal. American Guernsey Cattle Club. Edited by the Secretary, Wm. H. Caldwell. *Q.* $2. 1895. Peterboro, N. H.

Hoard's Dairyman. W. D. Hoard. *W.* $1. 1870. Fort Atkinson, Wis.

Holstein-Friesian Register. F. L. Houghton, ed. and pub. *S-M.* $1.50. 1886. Brattleboro, Vt.

Holstein-Friesian World. C. G. Brown, ed. and pub. *S-M.* $1. 1904. Ithaca, N. Y.

Home and Farm. Richard W. Knott. *S-M.* 50 cents. 1875. Louisville, Ken.

Homestead. James Atkinson. *W.* $1. 1855. Des Moines, Iowa.

Horseman and Spirit of the Times. Chicago Horseman Newspaper Company. ed. and pub. *W.* $2. 1831. Chicago, Ill.

Horseman and Stockman. Don D. Donnan. *M.* $1. 1887. Minneapolis, Minn.

Horse Review (Sporting). John C. Bauer. W. $2. 1889. Chicago, Ill.

Horse World. H. L. Allen. *W.* $2. 1872. Buffalo, N. Y.

Horticulture. W. J. Stewart. *W.* $1. 1904. Boston.

Hospodar. (Bohemian.) National Printing Company. *B-W.* $1. 1891. Omaha, Neb.

Hospodarske Listy. (Bohemian.) Ant. F. Vesely. *S-M.* $1. 1898. Chicago, Ill.

Idaho Student Farmer. D. C. Petrie. *Q.* 50 cents. 1908. Moscow, Idaho.

Illinois Agriculturist, College of Agriculture, University of Illinois. *M.* (except July, August, September). Urbana, Ill.

Illinois Farmer. John M. Stahl and A. Otis Arnold. *M.* 25 cents. 1906. Chicago, Ill.

Independent Farmer and Western Swine Breeder. Nebraska State Journal Company. (Consolidation of Nebraska Independent, Weekly State Journal and Western Swine Breeder. 1907.) Lincoln, Neb.

Independent Live Stock Reporter. James McCallum. *D.* $4. 1892. St. Louis, Mo.

Indiana Farmer. Indiana Farmer Company. *W.* 60 cents and $1. 1845. Indianapolis, Ind.

Industrial News and Southern Farmer. Union Printing and Publishing Company. *W.* 50 cents. 1906. Greenville, S. C.

Industrious Hen. T. L. Bayne. *M.* 50 cents. 1904. Knoxville, Tenn.

Inland Farmer. F. S. Powers. *W.* $1. 1902. Louisville, Ky.

Inland Poultry Journal. Theo. Hewes, ed. *M.* 50 cents. 1904. Greenfield, Ind.

Iowa Agriculturist. Agricultural Club of Iowa State College. *M.* (except July, August). 50 cents. 1901. Ames, Iowa.

Iowa Farmer. James F. Lavin, ed. and pub. *M.* 50 cents. 1902. Dubuque, Iowa.

Iowa Horticulture. State Horticultural Society. *M.* $1. 1908. Des Moines, Iowa.

Iowa State Register and Farmer. Geo. W. Franklin. *W.* $1. 1856. Des Moines, Iowa.

Irrigation. C. O. Sprenger. *M.* $1. 1903. Denver, Colo.

Irrigation Age. D. H. Anderson, ed. and pub. *M.* $1. 1885. Chicago, Ill.

Irrigon Irrigator. Addison Bennett, ed. and pub. *W.* $1.50. 1904. Irrigon, Ore.

Jersey Bulletin and Dairy World. D. H. Jenkins, ed. and pub. *W.* $1. 1883. Indianapolis, Ind.

Jersey Hustler. Orrie Walter, ed. and pub. *M.* 50 cents. 1897. Lebanon, Ohio.

Journal and Holstein-Friesian Advocate. H. M. Knox. *M.* 10 cents. 1907. Canton, N. Y.

Journal of Agriculture. H. J. Taylor. *W.* 50 cents. 1866. St. Louis, Mo.

Journal of Economic Entomology. E. Porter Felt. *M.* $2. Concord, N. H.

Kansas Agricultural Review. Students of State Agric. College, ed. and pub. *M.* 50 cents. 1903. Manhattan.

Kansas Farmer. Kans. Farmer Co. *W.* $1. 1863. Topeka.

Kentucky Farmer and Breeder. Jouett Shouse. *W.* $2. 1904. Lexington, Ky.

Kimball's Dairy Farmer. Kimball's Dairy Farmer Company. *S-M.* 50 cents. 1903. Waterloo, Iowa.

Klickitat County Agriculturist. Wm. J. Story, ed. and pub. *W.* $1.25. 1890. Goldendale, Wash.

Ladies Poultry Journal. M. A. K. Dorsey. *M.* 25 cents. 1903. Moberly, Mo.

Landmann. Joseph Levenich. *W.* $1. 1902. Milwaukee.

Live Stock and Dairy Journal. Chas. H. Blemer, ed. and pub. *M.* $1. 1903. Sacramento, Cal.

Live Stock Inspector and Farm News. W. E. Bolton, ed. and pub. *S-M.* 50 cents. 1894. Woodward, Okla.

Live Stock Journal. T. Butterworth. *W.* $1. 1868. Chicago, Ill.

Live Stock Journal. W. A. Cowan. *D.* $4. 1889. Indianapolis, Ind.

Live Stock Journal. R. E. Priest. *D.* $4. 1899. Pittsburg, Pa.

Live Stock Record. Buffalo Live Stock Record Company. *D.* $3. 1902. Buffalo, N. Y.

Live Stock Record. Live Stock Record Publishing Company. Four times a week. $2.50. 1897. Cincinnati, O.

Live Stock Reporter. C. E. Lee. *D.* $4. 1903. North Fort Worth, Tex.

Live Stock Reporter. C. C. Watson, ed. and pub. *W.* $1.50. 1888. Midland, Tex.

Live Stock Review. Chas. B. Murray, ed. and pub. *W.* $1.50. 1875. Cincinnati, Ohio.

Live Stock Tribune. Mrs. A. Basley. *M.* 50 cents. 1895. Los Angeles, Cal.

Louisiana Planter and Sugar Manufacturer. John Dymond. *W.* $3. 1888. New Orleans, La.

Maine Farmer. B. F. W. Thorpe. *W.* $1. 1833. Augusta.

Market Growers' Journal. C. F. Wood. *W.* $1. 1907. Louisville, Ky.

Maxwell's Talisman. Geo. H. Maxwell. *M.* $1. 1901. Chicago, Ill.

Michigan Farmer and Live Stock Journal. Lawrence Publishing Company. *W.* 75 cents. 1843. Detroit.

Michigan Poultry Breeder. Geo. S. Barnes, ed. and pub. *M.* 50 cents. 1885. Battle Creek, Mich.

Michigan Poultryman. Clark E. Beckwith. *M.* 25 cents. 1901. Grand Rapids, Mich.

Middle Georgia Farmer. W. E. H. Searcy, Sr. *W.* 50 cents. 1889. Griffin, Ga.

Mid-West Fancier. J. W. Reed. *M.* 25 cents. 1903. Kansas City, Mo.

Milk News. Milk News Publishing Company. *M.* 50 cents. 1894. Chicago, Ill.

Milk Reporter. John J. Stanton, Mgr. *M.* $1. 1881. Sussex, N. J.

Minnesota and Dakota Farmer. W. W. P. McConnell. *M.* 50 cents. 1893. Brookings, S. D.

Minnesota Dairyman. Dairyman Publishing Company. *M.* 25 cents. 1906. Northfield, Minn.

Minnesota Farm Review. C. P. Bull. *M.* 40 cents. 1882. (Minnesota School of Agriculture.) Minneapolis, Minn.

Minnesota Horticulturist. A. W. Latham. *M.* $1. 1894. Minneapolis, Minn.

Mirror and Farmer. John B. Clarke Company. *W.* 50 cents. 1851. Manchester, N. H.

Missouri Agricultural College Farmer. O. E. Reed. *M.* 50 cents. 1904. Columbia, Mo.

Missouri and Arkansas Farmer and Fruitman. R. J. Profitt. *M.* 50 cents. 1888. Kansas City, Mo.

Missouri and Kansas Farmer. Missouri and Kansas Farmer Company. *M.* 25 cents. 1884. Kansas City, Mo.

Missouri Valley Farmer. Arthur Capper, ed. and pub. *M.* 25 cents. 1892. Topeka, Kans.

Modern Farmer and Busy Bee. H. A. and N. J. Shephard, eds. and pubs. *M.* 25 cents. 1890. Eldon, Mo.

Modern Farming. J. M. Bell. *M.* $1. 1887. Richmond, Va.

National Coöperator and Farm Journal. Farmer's Educational and Coöperative Union Publishing Company. *W.* $1. 1880. Dallas, Tex.

National Farmer. E. D. Cowles. *W.* 75 cents. 1898. Bay City, Mich.

National Farmer (German). Andreas Simon. *B-M.* 75 cents. 1900. Winona, Minn.

National Farmer and Familien Journal (German). Westlicher Herold Publishing Company, pub. *S-W.* 50 cents. 1899. Winona, Minn.

National Farmer and Stock Grower. Philip H. Hale. *M.* 50 cents. 1899. St. Louis, Mo.

National Fruit Grower. Fruit Grower Publishing Company. *M.* 50 cents. 1894. St. Joseph, Mich.

National Grange. M. J. Bachelder. *W.* $1. 1907. Philadelphia, Pa.

National Live Stock Bulletin. Frank P. Bennett & Co. *M.* $1. 1907. Boston, Mass., Washington, D. C.

National Live Stock Reporter. Reporter Publishing Company. *D.* $4. 1890. National Stock Yards, Ill.

National Nurseryman. National Nurseryman Publishing Company. *M.* $1. 1893. Rochester, N. Y.

National Stockman and Farmer. Axtell-Rush Publishing Company. *W.* $1. 1877. Pittsburgh, Pa.

National Swine Magazine. R. R. Fisher. *M.* 50 cents. 1907. Freeport, Ill.

National Union Farmer. T. J. Brooks. *S-M.* $1. 1906. Greenfield, Tenn.

Nebraska Dairyman and Up-to-date Farmer. J. E. Edgerton. *M.* 50 cents. 1897. Lincoln, Neb.

Nebraska Farmer. S. R. McKelvie. *W.* $1. 1859. Lincoln, Neb.

Nebraska Farm Journal. W. T. Laing. *M.* 25 cents. 1896. Omaha, Neb.

New England Farmer. Ullery & Co. *W.* $1.50. 1822. Brattleboro, Vt.

New England Homestead. Orange Judd Company. *W.* $1.50. 1867. Springfield, Mass.

New England Poultry Journal. Consolidated Publishing Corporation. *M.* 50 cents. 1902. New Haven, Conn.

New Jersey Farmer and Home World. E. R. Collins. *M.* 25 cents. 1905. Westfield, N. J.

New State Poultryman. C. W. and A. M. Griffin. *M.* 25 cents. 1906. Oklahoma City, Okla.

New York Farmer. H. A. Van Fredenberg. *W.* $1. 1881. Port Jervis, N. Y.

New York Produce Review and American Creamery. Urner-Barry Company. *W.* $1. 1886. New York, N. Y.

North Dakota Farmer. E. F. Ladd. *M.* 50 cents. 1899. Lisbon, N. D.

North Pacific Rural Spirit. M. D. Wisdom, ed. and pub. *W.* $1.50. 1869. Portland, Ore.

Northwestern Agriculturist. P. V. Collins. *W.* $1. 1885. Minneapolis, Minn.

Northwestern Dairyman and Produce News. Midway Publishing Company. *S-M.* $1. 1908. St. Paul, Minn.

Northwestern Farmer. Max Gocha. *M.* 50 cents. 1902. Menominee, Mich.

Northwestern Stockman and Farmer. Chas. H. Reifernath and associates, eds. and pubs. *S-M.* $1. 1884. Helena, Mont.

Northwest Farm and Home. Mr. and Mrs. Legh R. Freeman. *M.* $2. 1847. North Yakima, Wash.

Northwest Horticulturist, Agriculturist and Dairyman. C. A. Tonneson, ed. and pub. *M.* 50 cents. 1888. Tacoma, Wash.

Northwest Pacific Farmer. Frank Lee. *W.* $1. 1871. Portland, Oregon.

Northwest Poultry Journal. C. F. Williams. *M.* 50 cents. 1895. Salem, Ore.

Nut Grower. J. F. Wilson. *M.* 50 cts. 1902. Poulan, Ga.

Obzor (Bohemian). F. Fabian, ed. and pub. *S-M.* 60 cents. 1891. Hallettsville, Texas.

Odalmannen (Swedish). Swedish Printing Company. *S-M.* 50 cents. 1904. Minneapolis, Minn.

Ohio Farmer. Lawrence Publishing Company. *W.* 75 cents. 1848. Cleveland, Ohio.

Ohio Horseman. Ohio Horseman Publishing Company. *S-M.* $1. 1907. Jamestown, Ohio.

Oklahoma Agriculturist. P. P. Duffy. *S-M.* 50 cents. 1906. El Reno, Okla.

Oklahoma Farmer. Farmer Publishing Company. *W.* 50 cents. 1890. Guthrie, Okla.

Oklahoma Farm Journal. Oklahoma Farm Journal Company. *S-M.* 50 cents. 1893. Oklahoma City, Okla.

Orange Judd Farmer. (Western edition.) Herbert Myrick, ed. and pub. *W.* $1. 1884. Chicago, Ill.

Orchard and Farm. Leigb H. Irvine. *M.* $1. 1886. San Francisco, Cal.

Oregon Agriculturist. W. E. Williamson. *S-M.* 50 cents. 1891.

Orff's Farm and Poultry Review. Farmer Orff, ed. and pub. *M.* 20 cents. 1900. St. Louis, Mo.

Orpington Poultry Journal. Scotch Plains, N. J.

Otwell's Farmer Boy. W. B. Otwell. *M.* 50 cents. 1905. Carlinville, Ill.

Pacific Coast Fanciers' Monthly. Chas. R. Harker, ed. and pub. *M.* 75 cents. 1885. San José, Cal.

Pacific Dairy Review. Wm. H. Saylor. *W.* $1. 1901. San Francisco, Cal.

Pacific Fancier. Mrs. O. H. Burbridge. *M.* 50 cents. 1904. Los Angeles, Cal.

Pacific Fruit World. M. V. Hartranft. *W.* $1. 1895. Los Angeles, Cal.

Pacific Homestead. R. J. Hendricks. *W.* $1. 1900. Salem, Ore.

Pacific Northwest. Philip S. Bates. *M.* 50 cents. 1903. Portland, Ore.

Pacific Poultryman. Maj. C. Hunt, ed. and pub. *M.* 50 cents. 1895. Seattle, Wash.

Pacific Poultryman. F. B. Covington. *M.* 50 cents. 1896. Tacoma, Wash.

Pacific Rural Press. Frank Honeywell, mgr. *W.* $2. 1870. San Francisco, Cal.

Packer. (Editions in New York, Chicago, Cincinnati and Kansas City.) Barrick Publishing Company. 'W. $1. 1893. Kansas City, Mo.

Park's Floral Magazine. Geo. Watt Parks. *M.* 10 cents. 1871. La Park, Pa.

Peach Grower, Fruit Culturist and Truckers' Magazine. R. M. Martin, ed. and pub. *M.* 50 cents. 1902. Savannah, Ga.

Peach Growers' Journal and Apple Trade Review. W. John Hinchey, ed. and pub. *M.* $1. 1899. Middleport, N. Y.

Pennsylvania Farmer. Messenger Printing Company. *W.* $1. 1880. Meadville, Pa

Pennsylvania Grange News. W. F. Hill. *M.* 25 cents. 1904. Huntingdon, Pa.

Pet Stock Magazine. A. D. Hosterman, pub. *M.* 50 cents. 1904. Springfield, Ohio.

Pigeons. Poultry Publishing Company. *M.* $1. 1906. Peotone, Ill.

Pigeon News. C. E. Twombly. *S-M.* $1. 1895. Boston, Mass.

Planters' Journal. H. L. Bedford. *M.* 50 cents. 1887. Memphis, Tenn.

Poultry. Poultry Publishing Company. *M.* $1. 1904. Peotone, Ill.

Poultry and Dogs. J. R. Cote, ed. and pub. *M.* 10 cents. 1906. Chatham, Ont.

Poultry Culture. R. V. Hicks. *M.* 25 cents. 1886. Topeka, Kan.

Poultry Digest. J. W. Walsuffer. *M.* 25 cents. 1906. New York, N. Y.

Poultry Fancier. Frank Heck. *M.* 25 cents. 1897. Chicago, Ill.

Poultry Gazette. Ralph H. Searle. *M.* 50 cents. 1897. Clay Center, Neb.

Poultry Herald. H. A. Nourse. *M.* 50 cents. 1888. Saint Paul, Minn.

Poultry Husbandry. Hawkins Publishing Company. *M.* 50 cents. 1906. Waterville, N. Y.

Poultry Item. E. E. Althouse. Item Publishing Company, Inc., pub. *M.* 50 cents. 1898. Sellersville, Pa.

Poultry Journal. Frank H. Snow, ed and pub. *W.* $1.50. 1895. Petaluma, Cal.

Poultry Keeper. F. Piggott. *M.* 50 cts. 1884. Quincy, Ill.

Poultry Life of America. H. B. Savage. *M.* 50 cents. 1892. Belton, Tex.

Poultry Monthly. D. M. Green. *M.* 50 cents. 1903. Syracuse, N. Y.

Poultry News. John Engel, Jr., ed. and pub. *M.* 25 cents. 1903. Jersey City, N. J.

Poultry Record. Chas. E. Cram. *M.* 25 cents. 1907. Carey, Ohio.

Poultry Review. E. W. Philo. *M.* 50 cents. 1903. Elmira, N. Y.

Poultry Success. A. D. Hosterman. *M.* 50 cents. 1889. Springfield, Ohio.

Poultry Topics and Western Poultry News. J. C. Seacrest, ed. and pub. *M.* 25 cents. 1889. Lincoln, Neb.

Poultry Tribune. R. R. Fisher, ed. and pub. *M.* 50 cents. 1895. Freeport, Ill.

Poultry World. Woolstencraft & Hansell. *M.* 25 cents. 1904. Heron Lake, Minn.

Poultry Yard. E. G. Wardin. *M.* 25 cents. 1906. Charlotte, N. C.

Practical Dairyman. Tredwell G. Hopkins. *W.* $1. 1907. New York, N. Y.

Practical Farmer. L. H. Cooch. *W.* $1. 1855. Philadelphia, Pa.

Practical Farmer Boy. Lew. E. Worster, ed. and pub. *M.* 25 cents. 1906. Saratoga, Ind.

Prairie Farmer. C. P. Reynolds, ed. *S-M.* 35 cents. 1841. Chicago, Ill.

Pratisk Farming. S. B. Salenson. *S-M.* 50 cents. 1907. Fargo, N. D.

Produce News. H. L. Preston. *W.* $1. 1900. New York, Cincinnati and Chicago.

Profitable Poultry. Davis Publishing Company. *M.* 50 cents. 1906. Milton, Wis.

Progressive Country Life. F. L. and C. L. Sherrill, eds. and pubs. *W.* 60 cents. 1902. Rockville, Ind.

Progressive Farmer. H. E. Wheaton. *M.* 50 cents. 1907. La Crosse, Wis.

Progressive Farmer. Clarence H. Poe, W. F. Marshall and W. F. Massey. *W.* $1. 1886. Raleigh, N. C.

Progressive Poultry Journal. Clauson W. Downey. *M.* 50 cents. 1903. Mitchell, S. D.

Purdue Agriculturist. Editorial Committee, University students. *M.* 50 cents. 1906. Lafayette, Ind.

Ranch. Leonard Fowler. *S-M.* 50 cents. 1895. Seattle, Wash.

Ranch and Range. H. S. Groves, ed. and mgr. *M.* $1. 1900. Denver, Colo.

Range Ledger. Clarence M. Miles, ed. and pub. *W.* $1.50. 1889. Hugo, Col.

Record-Stockman. F. P. Johnson. *D.* $3. 1880. Denver.

Reliable Poultry Journal. Grant M. Curtis *M.* 50 cents. Quincy, Ill.

Rice Industry. Chas. A. Newning and Ed. Mott. *M.* $1 1900. Houston, Texas.

Rice Journal and Southern Farmer. Signal Printing Company. *M.* $1. 1898. Crowley, La.

Rocky Mountain Husbandman. R. N. Sutherlin. *W.* $2. 1875. Great Falls, Mont.

Rural Advocate. Rural Advocate Publishing Company. *M.* 25 cents. 1904. Battle Creek, Mich.

Rural Californian. Henry W. Kruckeburg. *M.* $1. 1877. Los Angeles, Cal.

Rural Farmer. A. J. Merrill, ed. and pub. *W.* $1. 1880. Philadelphia, Pa.

Ruralist. M. V. Carroll. *W.* 50 cts. 1902. Sedalia, Mo.
Rural Life (formerly Farm Stock Journal). Francis B. Mitchell. *M.* 50 cents. 1858. Rochester, N. Y.
Rural New-Yorker. H. W. Collingwood. *W.* $1. 1850. New York, N. Y.
San Joaquin Valley Farmer. W. R McIntosh. *S-M.* $1. 1899. Fresno, Cal.
San José Fancier's Monthly. Chas. R. Harker, ed. and pub. *M.* 75 cents. 1885. San José, Cal.
Seed Time and Harvest. Isaac F. Tillinghast. *M.* 25 cents. 1880. Scranton, Pa.
Shepherd's Criterion. Frank E. Moore. *M.* 50 cents. 1891. Chicago, Ill.
Sioux City Live Stock Record. J. F. Smalley. *D.* $4. 1901. Sioux City, Iowa.
Skandinaven (Norwegian-Danish). John Anderson. *S-M.* 1866. Chicago, Ill.
Skandinavisk Farmer Journal (Norwegian-Danish). C. Rasmussen Publishing Company. *M.* 50 cents. 1882. Minneapolis, Minn.
Skördemannen (Swedish). Aug. E. Johanson. *S-M.* 75 cents. 1888. Minneapolis, Minn.
South Dakota Farmer. Dotson and Cook. *W.* 50 cents. 1902. Sioux Falls, S. D.
South Dakota Farm Journal. Frank Kelley. *M.* 10 cents. 1906. Woonsocket, S. D.
Southern Agriculturist. Southern Agriculturist Company. *S-M.* 50 cents. 1869. Nashville, Tenn.
Southern Cultivator and Dixie Farmer. G. F. Hunnicutt. *S-M.* $1. 1843. Atlanta, Ga.
Southern Fancier. H. F. Reils. *M.* 50 cents. 1887. Atlanta, Ga.
Southern Farmer. John J. David, ed. and pub. *M.* 50 cents. 1886. Birmingham, Ala.
Southern Farm Gazette. Chas. M. Scherer, Clarence H. Poe and W. F. Massey. *W.* $1. 1895. Starkville, Miss.
Southern Farm Journal. C. L. Stratton. *M.* 50 cents. 1907. Chattanooga, Tenn.
Southern Farm Journal. Manufacturers' Record Publishing Company. *M.* $1. 1893. Baltimore, Md.
Southern Fruit Grower. Robert S. Walker. *M.* 50 cents. 1896. Chattanooga, Tenn.
Southern Fruit Journal. James Harrison, ed. and pub. *M.* 50 cents. 1901. Montezuma, Ga.
Southern Planter. J. F. Jackson. *M.* 50 cents. 1840. Richmond, Va.
Southern Poultry Journal. S. J. Hopper. *M.* 50 cents. 1893. Dallas, Tex.
Southern Poultry Magazine. John A. Murkin, Jr. *M.* 50 cents. 1906. Nashville, Tenn.
Southern Poultryman. J. G. McReynolds. *M.* 50 cents. 1899. Dallas, Texas.
Southern Ruralist. F. J. Merriam, *S-M.* $1. 1894. Atlanta, Ga.
Southern Shippers' Guide. Theo. G. Thomas. *W.* 50 cents. 1902. Houston, Texas.
Southern Tobacco Journal. G. E. Webb. *W.* $2. 1887. Winston-Salem, N. C.
Southwestern Farmer. R. R. Claridge. *S-M.* $1. 1904. Houston, Tex.
Southwestern Farmer and Breeder. C. E. Lee. *W.* 50 cents. 1904. North Fort Worth, Texas.
Southwestern Stockman. Frank H. Owen. *W.* $2. 1884. Phoenix, Ariz.
South St. Paul Daily Reporter. E. L. Ogilvie, ed. and pub. *D.* $4. 1891. South St. Paul, Minn.
Spirit of the West (live-stock). Phil S. Kell. *W.* $1. 1890. Des Moines, Iowa.
Sports of the Times. (Horse interests.) E. B. Abercrombie. *W.* $4. 1902. New York.
Squab Bulletin. E. M. Van Duzee, Jr., ed. and pub. *M.* 50 cents. 1904. Saint Paul, Minn.
Standard Guide. T. W. Jerrems, Jr. *M.* 50 cents. 1905. Chicago, Ill.
Stock Farm. Stock Farm Publishing Company. *W.* $2 1883. Lexington, Ky.
Stock Grower and Farmer. J. K. Calkins. *W.* $2. 1902. Cody, Wyo.
Stock Growers' News. Hugh Jeffries, ed. and pub. *W.* $1. 1905. Fort Pierre, S. D.
Stock Yards Daily Journal. W. E. Warrick. *D.* $4. 1897. St. Joseph, Mo.
Student Farmer. Student Farmer Publishing Company. *M.* 50 cents. 1907. Madison, Wis.
Successful Farming. Successful Farming Publishing Company. *M.* 50 cents. 1902. Des Moines, Iowa.
Successful Poultry Journal. Frank Heck. *M.* 25 cents. 1897. Chicago, Ill.
Success Stock Farm Journal and Holstein Friesian Advocate. Harry M. Knox. *Q.* 10 cts. 1907. Canton, N. Y.
Sugar Beet News and Northwestern Farmer. A. L. Sawyer. *W.* 50 cents. 1902. Menominee, Mich.
Sugar Beet Scientific Quarterly. Lewis S. Ware. *Q.* $3. 1879. Philadelphia, Pa.
Sugar Planter. R. G. Dubroca. *W.* $1. 1858. Port Allen, West Baton Rouge, La.
Sugar Planters' Journal. Sugar Planters' Journal Company. *W.* $2. 1870. New Orleans, La.
Svenska Farm Journalen. O. M. Nelson. *S-M.* 50 cents. 1902. Omaha, Neb.
Swine Breeders' Journal. Wm. H. Morris. *S-M.* 50 cents. 1882. Indianapolis, Ind.
Tar Heel Poultryman. R. L. Simmons, ed. and pub. *M.* 25 cents. 1894. Lexington, N. C.
Team Owners' Review. E. H. Heinrichs. *M.* 1902. $1. Pittsburg, Pa.
Tennessee Valley Farmer. J. L. McReynolds, ed. and pub. *M.* 50 cents. 1907. Cleveland, Tenn.
Texas Farmer. Texas Farmer Publishing Company. *W.* $1. 1878. Dallas, Tex.
Texas Fruits, Nuts, Berries and Flowers. J. W. Canada, ed. and pub. *M.* $1. 1907. San Antonio, Texas.
Texas Stockman and Farmer. Vories P. Brown. *W.* $1. 1881. San Antonio, Tex.
Texas Stockman-Journal. A. W. Grant. *W.* $1. 1878. Fort Worth, Tex.
Thoroughbred Record. Thomas F. Kelly. *W.* $2. 1875. Lexington, Ky.
Threshermen's Review. J. R. Stone. *M.* 50 cents. 1892. St. Joseph, Mich.
Town and Country Journal. W. G. Bohannan and John Isaac. *S-M.* 50 cents. 1883. San Francisco, Cal.
Tribune Farmer. S. Cushman Caldwell. *W.* $1. 1841. New York, N. Y.
Tri-State Farmer and Gardener. Tri-State Publishing Company. *M.* 50 cents. 1897. Chattanooga, Tenn.
Trotter and Pacer. S. S. Toman, ed. and pub. *W.* $2. 1894. New York, N. Y.
Truck Farmer of Texas. J. C. Loving. *M.* $1. 1899. Dallas, Texas.
Turf, Farm and Home. E. P. Mayo. *W.* $1.50. 1889. Waterville, Me.
Twentieth Century Farmer. T. F. Sturgess. *W.* $1. 1900. Omaha, Neb.
Union Educator and Diversified Farmer. J. A. Vanden Burg. *S-M.* 50 cents. 1905. Birmingham, Ala.
Up-to-date Farming. J. A. Everitt, ed. and pub. *S-M.* 50 cents. 1898. Indianapolis, Ind.
Vick's Magazine (horticulture, floriculture, and household). Vick's Magazine Company. *M.* 50 cents. 1878. Dansville, N. Y.
Virginia Farmer. Virginia Farmer Company. *M.* 25 cents. 1886. Emporia, Va.
Wallace's Farmer. Henry Wallace. *W.* $1. 1895. Des Moines, Iowa.

Plate V. An Eastern farming country. Valley scene in central New York

Water and Forest. E. A. Walcott. *Q.* 50 cents. 1900. San Francisco, Cal.

Wayne Farmer. Farmer Publishing Company. *W.* 25 cents. 1883. Hagerstown, Ill.

Western Farmer. P. L. Axling. *W.* $1. 1902. Spokane, Wash.

Western Farm Journal. R. A. Turner, ed. and pub. *M.* 10 cents. 1905. Ellensbury, Wash.

Western Farm Journal. Wm. A. Hutton. *M.* 25 cents. 1872. Des Moines, Iowa.

Western Horseman. J. W. Neal. *W.* $2. 1878. Indianapolis, Ind.

Western New York Apple. L. P. McNeeley. *M.* $1.50. Barker, N. Y.

Western Poultry Journal. E. E. Richards, ed. and pub. *M.* 50 cents. 1888. Cedar Rapids, Iowa.

Western Poultry World. W. C. Shuman, ed. *M.* 50 cents. 1902. Denver, Colo.

Western Swine Breeder. E. F. Fassett, ed. and pub. *M.* 25 cents. 1894. Lincoln, Neb.

Wiregrass Farmer and Stockman. J. Lawrence, ed. and pub. *W.* $1. 1902. Ashburn, Ga.

Wisconsin Agriculturist. C. H. Everett. *W.* 75 cents. 1876. Racine, Wis.

Wisconsin Farmer. Wisconsin Farmer Company. *W.* $1. 1881. Madison, Wis.

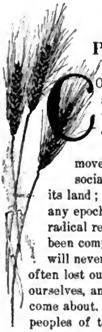
Wisconsin Sugar Beet. C. W Fraser. *M.* 50 cents. 1900. Menominee Falls, Wis.

Woodland and Roadside. Edwin A. Start. *M.* 50 cents. 1902. Boston, Mass.

Woman's Farm Journal. H. M. Brockstett. *M.* 10 cents. 1891. St. Louis, Mo.

CHAPTER III

PHASES OF THE AGRICULTURAL SHIFT



CONTINUOUS CHANGE follows any business that is alive and growing. Only dead issues are static. Yet we have not accepted change as frankly in agriculture as in other business; this is probably due to the fact that agriculture is so old and has been so much controlled by custom that we have accepted stability as one of its necessary qualities, and also to the fact that it is tied to land and land does not move. If land does not move, all other conditions of agriculture do move or change: population, markets, methods, social relations, ideals of life. It is of course the first effort of agriculture to adapt itself to its land; it is equally its necessity, however, to adapt itself to the changed conditions of life in any epoch. Within the past century, the agriculture of all well-civilized peoples has undergone radical redirection. All the old methods and outlooks have been challenged and most of them have been completely upset. There has never been such an era of change; and in all likelihood there will never be another shift of such fundamental extent. So great has been this flux that we have often lost our old bearings before we have fully apprehended the new. We have not yet re-adapted ourselves, and it is likely that the present century will close before any exact adaptation will have come about. We may be well content if within two centuries the agricultural practice of the best peoples of the world readjusts itself so as to constitute the material and social mainspring of a maturing civilization.

We all recognize that we are now beginning to emerge from this transformation; or, at all events, we are conscious of the shift and are trying to understand it. Some few features of the contemporaneous change in agriculture in North America are set down in this chapter; it is no part of the plan of this book to discuss all features of it. We first consider what influence is exerted on agriculture in general by regional conditions (Davenport); we then follow with more detail in a discussion of the changes that have taken place in a particular long-settled region (Marquis); we then discuss features of the abandoned farm question (Fowler); we consider the extent to which the negro has adjusted himself to land-occupation, since he has only recently been given control of himself and since he is the largest race question in our agriculture (Washington); we then review the effect of the marvelous development of machinery on agriculture and country life (Quaintance); and we close with an article on the shift in rural population and another on the shift in regions of production (Kinley).

To some minds, these great changes have been cause for alarm. It is true that there are vast inequalities in the mutation. At first, there is only an upsetting of established conditions. The readjustment comes slowly, and more slowly under some conditions than under others. The wheels move laboriously. Some persons perish under them. It needs perspective to realize the final net results.

We are now quite sure that we have passed the worst of it. A large part of the non-adjustable population has moved out. The remainder must follow. A new population is moving in; but the most hopeful part is the fact that the established rural population is now seriously taking up the task of fitting itself for its business.

In times past, individual farms here and there have been very successful, due to the accident of location or markets, or other fortunate circumstances; small prizes were expected by all the people, as wants and opportunities had not been closely differentiated: but it is probably true that there has never been a time in North America when agriculture in general has been so profitable and resourceful and so well able to prove itself as at present. If some regions and some persons are disadvantaged, this does not affect the statement: the disadvantaged regions will also discover themselves in due time.

One hundred years ago.

Complaint of the agricultural status is not new, although the readjustment seems never to have been so far-spread and complete as in the present day. It may be suggestive to consider some of the statements and conditions of one hundred years ago (see Report Industr. Com., X, p. 1004).

The best information concerning the agricultural status of this country at the close of the eighteenth century is that contained in the correspondence of George Washington, particularly in that part of it conducted with Arthur Young, the famous English agricultural writer. At Young's suggestion, Washington made an inquiry into the condition of agriculture, and this inquiry was published after Washington's death. Although the farming lands were then relatively new, nevertheless the yield of crops was remarkably small as compared with that from the same regions today. R. Peters, for example, living at Belmont, within six miles of Philadelphia, writes in 1791 that "about 8 bushels of wheat per acre is a full allowance for the better kind of farms in these parts. Some do not yield 6, and eight out of ten do not come up to 8 bushels per acre." He also reports that a dairy of 8 cows should give an average yield of 2 pounds of butter per week for each cow, making an average through the year of 104 pounds, or 832 pounds for the herd. At the present time the yield of wheat in Pennsylvania and adjacent regions averages at least twice the figures given by Mr. Peters, and the best farms much exceed that amount. The ordinary farm dairy today, in that region, should average 250 pounds of butter to the cow, and the best herds will exceed that figure.

The general low state of agriculture in Virginia may be judged from the following extract from one of Washington's letters, written from Mount Vernon in 1787: "The cultivation of tobacco has been almost the sole object with men of landed property, and consequently a regular course of crops have never been in view. The general custom has been, first, to raise a crop of Indian corn (maize), which, according to the mode of cultivation, is a good preparation for wheat; then a crop of wheat, after which the ground is respited (except from weeds and every trash that can contribute to its foulness) for about eighteen months; and so on, alternately, without any dressing, till the land is exhausted; when it is turned out, without being sown with grass seeds or reeds or any method taken to restore it, and another piece is ruined in the same manner. No more cattle is raised than can be supported by lowland meadows, swamps, etc., and the tops and blades of Indian corn, as very few persons have attended to sowing grasses and connecting cattle with their crops. The Indian corn is the chief support of the laborers and horses. Our lands, as I mentioned in my first letter to you, were originally very good; but use and abuse have made them quite otherwise."

Following is a sketch of the products of a good farm in Bucks County, Pa., in 1791. It is "an estimate of what may be supposed the average annual product of the different articles raised on the lands" near Philadelphia:

"Quantity, 200 acres: Value, 3,200 dollars,—two hundred acres being nearly the average quantity of the farms in this quarter, have taken that as the most convenient portion from which to form the required estimates.

"Arable land, 125 acres. The arable land, divided into five fields, of twenty-five acres each, makes in the whole 125 acres.

"Pasture, 50 acres. The course of cropping pursued here requiring three fields to be under tillage, two of course will be left for pasture, which make 50 acres.

"Orchards, etc., 10 acres. Orchard, garden, house, and barn, yards, lanes, etc.; supposed to occupy 10 acres.

"Meadow, 15 acres. The natural meadows in this part of the country being few, yet as every farmer finds means for allotting some portion of his land for that use, suppose the nearest average 15 acres.

"Woodland, 50 acres. Timber being an article indispensably necessary for fuel, fencing, building, etc., have allowed 50 acres for that use.

"Wheat, 200 bushels, at 90 cents per bushel, is 180 dollars. One of the aforesaid fields is allotted, in rotation, for wheat and rye; suppose twenty thereof to be sown with wheat, will yield, communibus annis, ten bushels per acre; for although in seasons, on well improved grounds, twenty, thirty, and even thirty-five bushels may be produced from the acre; yet from the many casualties to which land tillage is exposed, so that in some seasons the best improved ground may not produce even five bushels; have, from my own observation, and that of an intelligent neighboring farmer, taken the above as the nearest supposed medium, making two hundred bushels; which, at 90 cents per bushel, is 180 dollars.

"Rye, 50 bushels, at 60 cents per bushel, 30 dollars. Rye likewise, ten bushels to the acre; the remainder of the field, being five acres, will yield fifty bushels, which, at sixty cents per bushel, make 30 dollars. N. B.—The field on which the wheat and rye is sowed is generally also put in with grass, and lays for pasture two years.

"Corn, 300 bushels, at 40 cents, 120 dollars. One field is generally allotted to Indian corn and buck-wheat, in the same proportion with wheat and rye; the 20 acres of corn will average 15 bushels per acre, making in the whole 300 bushels, at 40 cents per bushel, is 120 dollars.

"Buck-wheat, 75 bushels, at 30 cents, is 22 dollars and 50 cents. This grain is so precarious in its growth that it is extremely difficult to form an estimate of its general produce; but suppose 15 bushels per acre, which, from five acres, being the remainder of that field occupied by the corn, will be 75 bushels, valued at 30 cents per bushel, is 22 dollars, 50 cents.

"Barley. So little of this grain is raised here, that I did not think it worth notice.

"Oats, 100 bushels, at 20 cents per bushel, 20 dollars. By the course of cropping commonly used here, this grain is sowed for the sake of ease and convenience to the farmer, upon some part of the fallow intended for wheat, to which it generally proves injurious, therefore is not largely propagated; have only allotted five acres, which will average twenty bushels per acre, making in the whole 100 bushels, at 20 cents per bushel, is 20 dollars.

"Flax and seed, 30 dollars. This is also generally raised on part of the fallow; suppose two, which, on an average, may yield 250 pounds of swingled flax and 12 bushels of seed, which, both together, may be worth 30 dollars.

"Apples and cyder, 30 dollars. Every farm has more or less of orcharding; eight acres allowed for that use, the product whereof, in apples and cyder cannot be worth less than 30 dollars.

"Hay, 20 tons; value, 120 dollars. Although 15 acres only are allotted for meadow, which, probably, on an average, will not yield more than that number of tons, yet as the farmers, by sowing grass-seeds on their lands, improved with dung, plaster of Paris, etc., annually mow more or less of those, I have allowed 20 tons, worth six dollars each, makes 120 dollars.

"Cattle, annual product, 70 dollars. I suppose a farm of 200 acres will, on an average, support 12 head of cattle; of those, I suppose five milch cows, which will each yield per annum one calf, two of them to be raised and three fatted, the latter worth six dollars. Five milch cows will produce fifteen pounds of butter per month each for seven months, which makes in the whole 525 lbs., at nine cents per lb. makes 47 dollars 25 cents, five months allowed for their being farrow or fatting the calves. Two calves annually raised, affords opportunity for disposing of that number of cattle annually, either in beef or milch cows, which, being worth 16 dollars each, makes 32 dollars, making in the whole 79 dollars 25 cents. Deduct for accidents, etc., nine dollars 25 cents, leaves an annual product of 70 dollars.

"Horses. Whatever these may produce must be considered as included in the general product of the farm, for the cultivation of which they are made by the propagation of the animal, unless it be in the most interior parts of the country where no market can be procured for grain, etc.

"Sheep, annual product, 28 dollars. Twenty store sheep may be conveniently kept on a 200-acre farm; their wool will average 40 pounds per year, worth 23 cents per pound, which makes 10 dollars; their increase in lambs, twelve; this number being to be disposed of annually, either in lambs or fatted mutton, they may be worth 1½ dollars each, makes 18 dollars. Thus the whole annual product on sheep will be 28 dollars.

"Hogs, annual product, 80 dollars. Ten hogs may be considered as the average number raised annually on a 200 acre farm; weighing 200 net pounds each, making 2,000 lbs., at four cents per lb.; the value of the annual product will be 80 dollars.

"Poultry, annual product, 10 dollars. Suppose, on an average, ten dozen may be raised, worth one dollar per dozen; their product will be 10 dollars.

"Wood consumed in fuel, 25 cords. Allowing one kitchen fire, which burns more or less the whole year, and one other fire during the winter, for the convenience of the family; I suppose the two fires will consume 25 cords.

"Consumed by cattle, horses, sheep, hogs, and poultry: Indian corn, 200 bushels; rye, 25 ditto; buck-wheat, 40 ditto; potatoes, 75 ditto; hay, 20 tons.

"The family consumption may be estimated by what will support nine persons, viz., the man, his wife, and three children; one man hired by the year, one bound boy, and one girl; the extra hiring of hands in harvest and hay-making; spinsters, visitors, etc., equal to the maintenance of one person more during the year.

"Tax paid annually for defraying the expenses of the country, supporting the poor, and repairing the roads will average about $8."

This account shows that a good farm of 125 acres of arable land in eastern Pennsylvania could be expected to produce at that time 200 bushels of wheat, 300 bushels of corn, 100 bushels of oats, 75 bushels of potatoes, and 20 tons of hay. A representative farmer of eastern Pennsylvania was asked in 1900 to estimate what the average yield of such a farm would be, and he reported as follows: wheat, 1,250 bushels; corn, 1,500 bushels; oats, 500 bushels; potatoes, 500 bushels; hay, 50 tons; tobacco and other crops not mentioned. That is, the average earnings of a farm is four or six times greater today than it was in the same section 100 years ago. This fact is illustrated in the most remarkable way in the contrasts of fruit-growing of the two centuries. In 1791, for example, it was estimated that eight acres of orchard should produce apples and cider worth not less than $30, or less than $4 per acre. A first-class apple grower at the present day would be satisfied with nothing less than a net profit of ten to forty times this amount.

COMPARATIVE AGRICULTURE: THE INFLUENCE OF CONDITIONS ON AGRICULTURAL PRACTICE.

By *E. Davenport*

Agricultural practices are, to a surprising extent, the result of local or temporary conditions rather than of fundamental principles that are of general or widespread application. Failure fully to understand this fact is responsible for many disappointments in farming when attempts are made to adapt approved agricultural practice to new and unfamiliar conditions.

When an individual lives to manhood in the locality in which he was born, he learns the customs and the local practices as he learns the language, by daily contact and constant application. When such an one for any reason removes in middle life to another country, or even to another section of his own country, he instinctively takes his ideals and his practices with him, so prone are we all to assume that our particular conditions are universal, and that our special practices rest upon and are the outgrowth of general principles rather than of local conditions. Accordingly, this man is greatly surprised and not a little amused at the strangely different ways of doing things that he finds not only in common use, but resting upon as sure a foundation of assumption as were those in the country from which he came.

What now is the correct attitude of this man toward the new conditions and practices with which he finds himself surrounded? This question it is the business of comparative agriculture to discuss, as it is also the correct attitude of the farmer toward changing conditions in his own locality; so true it is that differences in conditions and, therefore, of practice, are often as great in the same locality at different times as they are between different localities at the same time.

First of all, it would be well if a great general principle could be more commonly understood, viz., that the practices of any community in any locality, or at any time, are what they are as the result of experience,—counting experience in the most general way. That is to say, there is a reason, and a sufficient reason, for every practice. It may not be a good reason, and it may not rest on a sound basis of fact; indeed it may be founded on the most erroneous beliefs, but in general there is a strong basis of actual fact running through whatever modes and methods have been generally adopted. Sometimes the reason has long since disappeared, while the practice still lingers as a matter of habit. So true is the principle, however, that different conditions call for different practices.

The results of many experiences ultimately express themselves in practice that it is safe for the newcomer in any country to begin with. He may adopt and use these practices of the neighborhood, rather than his own, until he can have time by careful study to bring into play his best knowledge of general principles, and come to sane and safe conclusions. He can then determine how many are to be modified, and how many are to be set aside altogether for the old ones he has brought with him, or for others to be devised upon the spot.

It is the object of comparative agriculture to outline some of the conditions that influence practice and to discuss some of the considerations that determine policies of procedure for different localities or for different periods in the development of the same locality.

Influence of climatic conditions on agricultural practice.

Of all the factors that influence yield, climatic conditions are the most potent. In general, a fertile soil will produce large yields, but the best of soils will produce only low yields in unfriendly climates and in off seasons.

For our purpose, climate consists essentially of three elements,—temperature, light, and moisture. All are absolute conditions of crop-production, and all exist in different parts of the world in varying proportions from the cold of the frozen North to the heat of the equatorial regions; from the dull skies of England to the almost constant sunlight of certain high altitudes; from the scanty moisture of semi-arid regions to the excessive rainfall of Burmah and the neighboring provinces of Asia.

These different degrees of heat, light, and moisture may exist largely independent of each other; that is to say, it is only in a general way that their maxima are correlated. There is, therefore, room for an almost unlimited variety of climatic conditions over the earth, every element of which, as well as the totality, exerts a controlling influence over crop-production and over methods of successful procedure.

Heat and light.—The influences of heat and light are roughly illustrated by the very broad differences between the agricultural conditions of the equatorial regions and the higher latitudes. On the equator the day is twelve hours long, whatever the season of the year. In the higher latitudes and in the growing season, the sun shines not twelve hours, but sixteen or more, according to the latitude.

Now, in general, growth is in proportion to light, and the day of sixteen hours has 25 per cent more sunlight than the day of twelve hours. To be sure, the angle of incidence is greater, and yet the conditions for growth are much more favorable in northern latitudes in the long days of June than in equatorial regions at any time of the year. The popular belief that vegetation grows much more luxuriantly in the tropics than elsewhere is true only when long periods of time are involved. The growth in the tropics is practically continuous. But for the reasons given it is not true for a day or a week in the height of the growing season.

This being the case, cultivation for the purpose of killing weeds can proceed much more leisurely in the lower latitudes. In higher latitudes, too, the temperature of the soil is relatively higher as compared with that of the air than is the case in lower latitudes. This has an influence in the same direction as that of light, and tends to give us the hot nights of the North as compared with the cool nights of the tropics.

Again, the longer season of the lower latitudes greatly extends the time of planting and of harvest. In the northern states the corn-planting season covers scarcely a fortnight; in Brazil it covers about four months, while in the Philippines it extends practically throughout the year. All this exerts a controlling influence upon the matter of rush and hurry as it does also upon the cost of production and the habits of life. There is no "*amanha*" [tomorrow] for the farmer of the North during the season of oat-sowing, corn-planting, corn-cultivation, or wheat harvest. On the contrary, his southern neighbor is seldom in a hurry and never rushed; nor need he be, for one day is so nearly like another, week after week, that he is almost unconscious of the passage of time.

Moisture.—The amount and distribution of moisture is a controlling factor in many phases of agricultural practice, and the affairs of farming are more frequently conducted with reference to rainfall than at first thought seems possible. In the North, weeds are the first great enemy to corn in the early spring, and, later on, lack of moisture is the second. With North Americans, the whole policy of corn-farming in July and later is with reference to the August drought, for then the greatest demand for moisture comes after the rainfall of the season has practically ceased. In Brazil and Argentina, however, both great corn countries, the crop is grown during the rainy season, when rainfall occurs almost every day; all of which radically alters the methods and practices of corn-farming and renders the weed problem of far less consequence.

It is a favorite expression in the North that tillage is manure, and we thus exaggerate cultivation in order to impress its meaning. Here the importance of cultivation can hardly be overestimated. Upon reflection, however, cultivation is seen not to be a fundamental operation at all. Consider some favored spot of rich porous land, newly formed at the bend of a river, in a tropical country where it rains every day. Let it also be free from the seeds of quick-growing weeds, as many such spots in reality are. Being also porous, it will be well drained. In such a case, all the conditions of successful growth are ready at hand. If the corn is put into the ground and the farmer takes a journey till the harvest, he will have a more beautiful crop than if he disturbs the roots by cultivation.

The same is true if we mulch instead of cultivate in the North, and we would raise corn that way except that it is too expensive. It is only by facts like these that we come to see that the actual purpose of cultivation is to provide more favorable conditions of growth than are commonly provided by unaided nature. It is, therefore, an incidental not a fundamental, farming operation, even though in many places and in certain seasons it may be the most important factor in securing a satisfactory yield. In this, as in other operations of the farm, if the true purpose and meaning are fully understood, the labor involved will be more intelligently bestowed, and it is more likely to be suspended when unnecessary.

Another good illustration of the influence of climatic conditions is with reference to cultivation of clay soils. In temperate regions, it is a cardinal principle not to cultivate clay soils when wet, lest they bake and become practically rock. In a country, however, in which it rains every day, this principle can be violated with impunity. The writer has seen exceedingly stubborn clays cultivated without evil results, as soon as the rainfall ceased and while still water-soaked. This was because rain was practically certain again next day.

It is fortunate, indeed, that this is true, for many of our most productive soils are clays lying in regions that will produce only in the rainy season, when rain falls practically every day. The principle involved, namely, that even clays do not become hard till they become dry, may be utilized in our so-called "wet seasons" except that in this case the farmer never knows what moment the rains may stop and be followed by a drought. Its use in the North is, therefore, too hazardous to be recommended; on the whole, it is better to sacrifice the crop.

Influence of soil on agricultural practice.

Even within the limits of the same climatic conditions the style of farming will depend almost absolutely upon the character of the soil. The crops and the rotation are and must be different for a heavy soil than for a light and sandy one. The cultivation must be deeper and it is in every way a heavier job, requiring different tools and more power. The whole outfit in teams and tools is heavier for farming a clay soil than for farming a sandy soil, and in every way the cultivation is different, calling for nicer judgment as to time and frequency, and better methods and higher skill in workmanship.

Sandy soils and dark loams are warm and early; wet soils, especially undrained clays, are cold and late. So true is this that the time of planting corn in southern Illinois is generally later than in Michigan or Wisconsin, 250 miles farther north. Not only is the date of planting late but it is followed much earlier by a drought, which, on an undrained clay, is especially trying. From the fact that in the early season the roots found plenty of moisture near the surface, the root system remains practically undeveloped. It is, therefore, less able to endure a drought than it would be in a freer soil in which its roots might extend farther and deeper, with correspondingly greater range for moisture. The writer has seen corn growing in wet clay until near tasseling time without extending its roots much beyond the limits of a "hatful" of soil.

Conditions such as these call for highly specialized methods of farming, in which tile drainage is fundamental. Tile drainage is fundamental on clay hills; the tiles serve first of all to get water into the soil.

Influence of customs and traditions on agricultural practice.

With the average man the strongest reason for doing a certain thing in a particular manner is that he has always done it that way, and that it has been customary in his family or his community. That is the chief reason why a particular style of architecture is seen to characterize both the houses and barns of a whole region, while another area may be developed from another center with different ideals and traditions. In one case, we find the "bank barn," in another, the "overshoot;" here lightning rods bristle at every available point, there the roofs are bare; here the barns are all red, there they are all drab, or left unpainted; here the houses all have green blinds, there they have the little "stoop" and no blinds; here the chimneys are on the outside of the house, there the buildings, fences, and even the trees are whitewashed; here the horses are driven with one line, there with two; here the plow turns the furrow to the right, there you will be gravely told why it is better for crops if the furrow is turned to the left. It was not so long ago that the iron plow was held to be poisonous to the soil. To such an extent was this believed that if a specially large crop were desired the land would be plowed with a wooden moldboard.

In one case, the crops will be planted at a particular time of the moon, and "butchering" will be done only when the moon is on the increase, that the meat may swell and not shrink in the skillet. In another case, no operation will be begun on Friday; in still another, not until the patron saint of the municipality has been consulted, his wishes learned and his consent obtained.

Whatever it is, from the most important affairs of farming to the most trivial, that which is most likely to be done will be that which is habitual, and that which agrees with the oracles of the neighborhood and the traditions of the grandmothers. This is partly because it is easier to do whatever has become customary, and it is partly because of a natural reluctance to do a thing in a new way, particularly if it is at variance with certain signs and traditions that have been handed down from father to son perhaps for generations.

This situation naturally divides itself into two issues,—one of the owner and the employer, the other of the employee, who may be fairly assumed to have less experience, less knowledge, and often less intelligence than the one whom he serves.

When the owner attempts to change customary procedures for newer and presumably better methods, he is at once beset with natural and inherent difficulties. He has, perhaps, discovered some fault in the old method, or seen some particular detail of improvement that he believes ought to be installed. But he soon reckons with the fact that even the most simple operations have established most complicated relations. Suppose, for example, that he has become convinced that drilling grain is better than broadcasting. His first uncertainty is as to the kind of drill to use, and his next as to how much seed he shall sow; and, being unfamiliar with the facts, he may make a mistake at either point that will more than offset the natural advantages of drilling.

When the shallow methods of cultivation were first advocated, their introduction was made difficult by the fact that shallowness was mistaken for lack of thoroughness, and good workmen felt that shallow cultivation was necessarily poor farming. They "liked to see the dirt roll up," and it took a long time to establish new standards of good workmanship. In this way, the best workmen often stand in the way of the introduction of improved methods.

"I don't believe in it" is a sufficient reason why some intelligent farmers do not try new methods; or, if they do try them, they do it in such a reckless and thoughtless manner as to violate every principle of success. As a matter of fact, the new method is many times more difficult than the old and requires much more careful attention, simply because it is new.

Custom and tradition weigh most heavily upon the employee, especially if he be ignorant and happen to have had "experience." In such an event the employer will have his hands full in getting the new method installed or even tried. Is it a new machine, it is badly adjusted, the parts come loose, it hurts the horses' necks, the seat does not fit, or in some essential particular it "won't work." If the owner insists upon its use, the most unforeseen and remarkable accidents happen to the tool, until in sheer despair the owner gives it up. The writer once heard a long story of the fruitless attempt of an extensive wheat-grower of Chili to introduce American yokes for his cattle, the upshot of it all being that he gave it up, let the peons hitch by the horns again, French fashion, and "took the difference out of their wages."

If the new custom runs counter to some "sign" or secret tradition in the family, or the religion of the workman, very little will be said about it, but in some way it will not be introduced. Nor is this limited to the most ignorant of peoples, for it is more common than is popularly supposed, as anybody will testify who has had extensive experience with wage-earners.

Evil habits once started among workmen seem to travel from hand to hand with that kind of "freemasonry" by which things are transmitted among children and ignorant people generally. The determination to hammer horse collars with a club to soften them has taken possession of certain communities to the distress of everybody, horses and their owners alike, yet it is one of the most difficult customs to break up. The disposition to "doctor" horses with all sorts of remedies takes possession of the teamsters of many a region, and, when it does, the hills and woods will be scoured for materials, often to the serious detriment of our most faithful servant. Many a farmer has had his best cow's horn surreptitiously bored and turpentine run in by a well-intentioned hired man, under the conviction that she was suffering from "holler horn;" or has had her tail split and a piece of fat pork laid in, to relieve her from "wolf in the tail."

In a general way, the day of tradition is passing, —especially in this country. This is an age of trying new and improved methods. This is difficult enough for the best trained and broadest minded, and we little imagine what a tenacious hold the old, the customary, and the traditional still have upon the relatively ignorant and uneducated. It is one of the stubborn facts of business that the farmer, and especially the younger farmer, must expect to reckon with. He will need to be somewhat shrewd and well balanced in order to know when, and how far, to fight such foolishness and when to let it alone and "take it out somewhere else." Of one thing the young farmer may rest assured: if he goes to a new country, he cannot afford to change its customs. It will not pay him to attempt it. If he tries it with natives, they will beat him in "ways that are dark and tricks that are vain," but they will beat him. If he imports laborers, unless they be of a superior grade, he will find them "adopting all the vices of the new country and forgetting the virtues of their own." The writer makes a good deal of this point because he has seen so much of failure in attempting the impossible in this direction.

Influence of race on agricultural practice.

Closely akin to the influence of customs and traditions is the influence of race. Of course, different races have different customs and these must not be transgressed. If two races inhabit the same country, there is generally a difference as to their relation to labor. This difference must be observed so far as the individual is concerned. If, as in countries where slaves exist, or have been recently held, it is "off caste" for a white man to work, then, a white man must not work. It is one of the dictums that must not under any circumstances be violated. Manifestly, under conditions such as these, the best methods cannot be introduced simply because they are beyond the capacity of the one race and beneath the dignity of the other.

Experience has shown, however, that racial traditions and customs must be reckoned with even in the inferior race. This is not through tender feelings of regard on the part of the superior race, but for the general reason that any man ignorant and stupid, as well as educated or gifted, will manage to cater to his individual notions of things as nearly as possible, and the more ignorant or stupid he is the more are these notions fixed by the customs and traditions of his race.

So it is, that, in general, it is cheaper to get along with these elemental prejudices than it is to fight them, all of which is one substantial reason that the world progresses so slowly in certain quarters. The writer, himself, saw a $200 cart of superior design utterly discarded on a large Brazilian fazenda for no other reason than that the wheels would not squeal like those of the wooden carts of the country. For this conspicuous shortcoming the cart was reported to be hoodooed, and therefore properly avoided, especially at night. Against all this prejudice, reason would not avail, and commercial interests were powerless. It was simply a large business fact to be reckoned with and treated accordingly, as it was, and the cart was left to rot.

The social, political, religious, and personal habits of a race all exert an influence; indeed, the very food habits of a people must be reckoned with. In the northern United States we assume that the farm laborer can perform all kinds of work and that he belongs to the same race as ourselves, with the same customs, habits and prejudices,—and, in general, that is true. This is by no means, however, a general principle. Whole communities of farm laborers may be only "hoe men," utterly incapable of performing any other kind of labor, and as unable to hitch and drive a horse, mule, or an ox, as would be a native Fiji Islander to run an automobile or drive a locomotive.

All these people have their prejudices, not only religious and racial, but in the way of food as well. The Portuguese laborer wants his beans, bnt the Italian must have his polenta or there will be trouble. For all these, and a thousand other reasons that cannot be even enumerated in limited space, the American farmer will find the scope of his operations limited and the problem vastly complicated the moment race questions become involved.

But all this is possible only with the most intelligent labor; indeed, not all of our American labor is equal to the new demands in this direction, and many farmers lose more by abuse and destruction of machinery than they gain by its advantages.

Influence of machinery on agricultural practice.

The introduction of machinery into agricultural operations is one of the severest tests of the intelligence of the laborer. In the United States much of the labor of the farm is performed by the owner or his family, or, if not, then by young men not themselves landowners but of the same class of people. Under conditions such as these, the most complicated machinery may be successfully operated, resulting both in the cheapening of the product, the lightening of the labor, and the great uplifting of the profession of farming.

In other countries where the intelligence is lower, machinery must be made simpler, and in many regions it cannot be introduced at all, sometimes from inability of the native to operate it, but often from mere ignorant prejudice. There is probably no single factor more potent in preventing agriculture from rising to a learned profession in certain portions of the earth than the fact that labor is confined to a race, or a class, too ignorant or too stupid to use machinery above the simplest sort of hand tools. One is frequently struck with the results often obtained by the crudest tools, and he is again amazed at the utter inability of the same individual to make use of a new implement of any kind. In this general field, the farmer who proposes to change his location must make no mistake.

Influence of domestic animals on agricultural practice.

In general the employment of animal labor to replace the labor of man has about the same uplifting influence as has the utilization of machinery. Speaking broadly, it can be employed by a lower grade of laborers than can machinery, and yet the observer is astonished when he comes fully to realize the large proportion of peasant and native laborers that are utterly unable to make the slightest use of animal labor. On a South American fazenda employing both European peasant labor and native blacks, not one out of ten had the slightest knowledge about driving either mules or oxen, or could be induced to come near them.

In another and larger sense, animal life figures largely in agricultural affairs, totally without reference to its labor. The problem of nitrogen supply for the soil is one that is always with us. The cheapest general supply of agricultural nitrogen is that which comes through the growth of leguminous forage crops. These crops are not edible by man, but are exceptionally valuable for our larger animals. So long, therefore, as density of population will permit the keeping of a large animal population, the nitrogen question will be easily managed; but in regions in which animals cannot be kept in numbers because of the dense human population, the nitrogen question will always be greatly more complicated, and the people must bring themselves to consume largely of leguminous seeds—much more largely than the most highly civilized races have yet cared to undertake.

Influence of unsound economic ideals on agricultural practice.

Confusion of mind as between outlay, income, and profit, is responsible for much unprofitable farming. Men instinctively feel that a large gross income means a large profit, yet at the same time they fail to see the true meaning of even a slight increase in yield or other form of income.

For example, A gets twenty-one bushels of wheat per acre, and B by better seed or better—not more expensive—methods gets twenty-three bushels. The difference seems slight, but how much more profitable is B's farming? It depends, of course, upon the cost of the crop. Suppose, for the moment, that it cost the value of twenty bushels of wheat to produce the crop in both cases,—then A's profit is one bushel and B's is three, which is another way of saying that B's farming is three times as profitable as A's, or that B can earn as much in one year as A can earn in three years. It is only when looked at in this way that the true meaning of this slight difference in yield becomes apparent; in other words, it is a ratio and not a difference that is involved.

It has been conclusively shown by Professor Fraser, of Illinois, that some cows can make fully three times as much butter-fat or total milk as can others from the same amounts of the same kind of feed. Now this does not mean that the one class of cows is simply three times as profitable as the other. It means vastly more than that, because from both incomes must be subtracted the same identical cost for feed, and when that is done the better cows will be found not three times, but many times, more profitable than their less efficient competitors.

Because of a common failure fully to appreciate this principle, many farmers fail to keep a good enough quality of animals or to put sufficient expense into the business to realize the highest profits. For example, a field is capable of yielding twenty-one bushels under ordinary conditions, but if, by the addition of expense to the extent of one bushel in the form of better seed, for fertilizer, or of better methods of seeding, the yield can be increased to twenty-four bushels it will certainly pay in the long run to incur the extra expense of one bushel for the extra yield of three bushels and the clear profit of two bushels.

Over a large share of the corn-belt there is every reason to believe that the soil is relatively deficient in phosphorus, so that with plenty of nitrogen, abundance of potassium, and a favorable season, the yield is limited by the shortage in phosphorus. This being the case the farmer does not get the best use of his nitrogen and his potassium, the first of which being soluble will be speedily lost in the drainage water, if not consumed by the crop. This is only another way of saying that he does not use his capital to the best advantage, and to invest a little more at the right point will be to increase his net profits. The principle is well illustrated by the following extracts from the published results of Dr. Hopkins' investigations on the wheat soils of Illinois[1] :

COMPARATIVE EFFECT OF STEAMED BONE MEAL AND RAW ROCK PHOSPHATE, IN CONNECTION WITH CLOVER AND MANURE.

Soil pot No.	Treatment applied	Wheat yields		Increase bushels per acre
		Grams per pot	*Bushels per acre	
101	None	10.0	27	
102	Clover	16.3	43	16
103	Bone meal	14.7	39	12
104	Rock phosphate	14.2	38	11
105	Clover, bone meal	22.2	59	32
106	Clover, rock phosphate	23.3	62	35
107	Manure	16.5	44	17
108	Clover, manure	22.7	60	33
109	Manure, bone meal	19.4	52	25
110	Manure, rock phosphate	19.5	52	25
111	Clover, manure, bone meal	23.1	62	35
112	Clover, manure, rock phosphate	23.3	62	35
113	Potassium	11.3	30	3
114	Clover, potassium	18.4	49	22
115	Potassium, bone meal	18.4	49	22
116	Potassium, rock phosphate	18.2	49	22
117	Clover, potassium, bone meal	21.9	58	31
118	Clover, potassium, rock phosphate	21.9	58	31
119	Manure, potassium	18.1	48	21
120	Clover, manure, potassium	19.1	51	24
121	Manure, potassium, bone meal	19.3	51	24
122	Manure, potassium, rock phosphate	19.0	51	24
123	Clover, manure, potassium, bone meal	25.3	67	40
124	Clover, manure, potassium, rock phosphate	25.3	67	40
125	None	10.6	28	

*It will be seen that the untreated soil (pot 101) yielded at the rate of 27 bushels of wheat per acre (28 bushels on the duplicate pot No. 125). Where clover was turned under (102) the yield was increased by 16 bushels; that is, from 27 to 43; and where bone meal was turned under with clover (105) the rate of yield was 59 bushels per acre, the increase of 32 bushels being just double that produced by clover without bone meal.

Where raw rock phosphate was turned under with clover (106), the wheat yielded at the rate of 62 bushels per acre, making a total increase of 35 bushels over the yield of the untreated soil. Of this 35 bushel increase, 16 bushels should be credited to the clover and 19 bushels to the rock phosphate.

The same principle is even better illustrated by the results of experiments on corn-production on certain peaty swamp soils that are normally rich in phosphorus and that contain ten or eleven times as much nitrogen as ordinary fertile soils, but are exceedingly deficient in potassium, in some cases so deficient as to yield absolutely no grain. Roughly speaking, the application of two to two and one-half dollars' worth of potassium salts per acre results at once in an increase of from twenty-five to sixty bushels per acre, or an average of something over thirty bushels, besides in some cases making all the difference between a good yield and none at all. It also illustrates the principle that the greatest gain does not necessarily follow the lowest investment, but that there is a certain magnitude and balance that must be attained in order that capital may be the most productive.

It was distinctly noticeable in these experiments that a light application even of an effective fertilizer did comparatively little good, leading Dr. C. G. Hopkins, the experimenter, to remark that on the soils in question, "200 pounds of potassium chlorid is worth very much more when applied to one acre than when scattered over four acres."

On the other hand, many farmers fail to recognize the operation of the law of diminishing returns, not realizing that successive increments of expense are not indefinitely followed by corresponding increments of yield and gain, a principle well illustrated in certain experiments at Rothamsted.

In these experiments wheat was grown continuously on plots treated as follows (other conditions being the same and thus not to be considered):

Plot 5, mixed minerals alone.
Plot 6, mixed minerals and 43 lbs. of nitrogen.
Plot 7, mixed minerals and 86 lbs. of nitrogen.
Plot 8, mixed minerals and 129 lbs. of nitrogen.
Plot 16, mixed minerals and 172 lbs. of nitrogen.

What now is the effect of these successive equal increments of nitrogen, the effective element for wheat-production on English soils? For the first eight years the yields were as follows :

No. of plot	Yield in bushels	Gain for 43 lbs. nitrogen
5	19	
6	27⅞	8⅞
7	35½	7⅝
8	36⅞	1⅜
16	37½	⅝

Here we note that the first and second increments were almost equally effective, the falling-off was marked in the third, and the fourth influenced the yield so slightly that it was discontinued five years later.

Fortunately, the others were continued, and, at the end of forty-eight years the average yields stood as follows :

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[1] Circular No. 96, pp. 10–12, Illinois Experiment Station.

No. of plot	Yield in bushels	Gain for 43 lbs. nitrogen
5	15	
6	24	9
7	33	9
8	36¾	3¾

These averages for this long period of time—almost half a century—indicate with great accuracy the relative efficiency of these three successive increments of effective fertilizers in the presence of abundant minerals. Again, the first and second increments are equally effective, but the third increment is less than half and but little more than a third as effective as the first two. Remembering the principle, that, in general, the first slight increments are not as effectual as larger amounts, and noting the great falling off between the second and the third, we are led to believe that the most effective point is near the upper part of the first increment or the lower limit of the second.

Another economic principle that fails to influence agricultural practice as it should is the influence of the market price of the crop. Farmers generally are persuaded or deterred from using fertilizers according as they are cheap or costly; the price of the crop is seldom considered as entering into the case. Upon reflection it will be seen that whether we shall raise large yields by expensive methods (many increments) or smaller yields with less outlay is, after all, mainly dependent upon the market price of the crop.

For example: If wheat is a dollar a bushel, the account would stand as follows, so far as nitrogen is concerned, each increment of nitrogen costing approximately six dollars and fifty cents.[1]

Plot	Yield	Increase	Value of Increase	Cost of Increase	Profit
5 . .	15	. .	. . .	. . .	. . .
6 . .	24	9	$9 00	$6 50	$2 50
7 . .	33	18	18 00	13 00	5 00
8 . .	36¾	21¾	21 75	19 50	2 25

At this price the greatest net income is with the second increment and the least profit is in the highest yield, but at two dollars a bushel the account would stand as follows:

Plot	Yield	Increase	Value of Increase	Cost of Increase	Profit
5 . .	15	. .	. . .	. . .	. . .
6 . .	24	9	$18 00	$6 50	$11 50
7 . .	33	18	36 00	13 00	23 00
8 . .	36¾	21¾	43 50	19 50	24 00

At this price the highest yield instead of being least profitable is most profitable, though not enough better than the second increment to warrant the extra outlay and the risk of a bad season.

At three dollars a bushel the account would stand as follows:

Plot	Yield	Increase	Value of Increase	Cost of Increase	Profit
5 . .	15	. .	. . .	. . .	. . .
6 . .	24	9	$27 00	$6 50	$20 50
7 . .	33	18	54 00	13 00	41 00
8 . .	36¾	21¾	65 25	19 50	45 75

At this price, the highest yield pays decidedly best, and is over twice as profitable as the yield from the first increment.

At eighty cents a bushel the account would stand as follows:

Plot	Yield	Increase	Value of Increase	Cost of Increase	Profit
5 . .	15	. .	. . .	. . .	. . .
6 . .	24	9	$7 20	$6 50	$0 70
7 . .	33	18	14 40	13 00	1 40
8 . .	36¾	21¾	17 40	19 50	—2 10

At this low price only the first increment yields any profit, and this is so small as to make it doubtful policy to undertake the outlay of six dollars and fifty cents to secure it.

Stated in general terms, we are warranted in this conclusion; viz., that when prices are high expensive methods and large outlays are warranted providing they will increase the yield (or other income) proportionally, but in times of low prices large outlays are dangerous, and maximum yields and large profits are impossible. Many years ago when the price of wheat suddenly dropped to unheard of figures, the advice was freely given to increase the yield per acre by greater outlay in labor and fertilizers in order to make up in yield what was lost in prices—thus holding the gross income stationary. It is hardly necessary to remark that those who followed this advice long enough lost their farms. The question in farming is not so much how large yields we are able to raise, but how large yields we can afford to raise. This principle is overlooked also by those who criticise American farming in comparison with the intensive methods in Europe.

Influence of scientific discovery on agricultural practice.

Before the application of science to agriculture the business of farming consisted principally of the labor of sowing, cultivating, and harvesting, all with reference to present conditions. The results of research have done much to draw the attention of farmers to the nature of their investment, the economic use and the protection of capital and the need of business organization. In other words, attention is directed to the future as well as to the present, and the element of permanency, especially in the treatment of soils, is gradually replacing the old wasteful practices that regarded only immediate results.

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[1] On the basis of fifteen cents per pound for commercial nitrogen.

This all tends to make agriculture a more valuable calling, and also to make it more difficult, both of which tend strongly to crowd out the least competent and put the business more and more into the hands of the most competent, the best-informed, and the most able men.

The medium by which this is brought about is very largely the increasing price of land. An acre of land is worth and will bring such a price as will yield an income equal to the net returns from the land, considering always the matter of safety of investment. This principle will make the land worth most to the man who can get most out of it for a long series of years, and it is very rapidly putting our lands into the hands of men of means, who are also informed as to the latest scientific facts of the business, using the term scientific in the broadest sense, and including economic as well as chemical and biological principles.

Influence of the period of development on agricultural practice.

Under primitive conditions, agriculture does not rise much, if at all, above the level of the hunt. In semi-civilized and in pioneer conditions, the family is the unit, and the "self-sufficing system" obtains in food-production as well as in the manufacture of the clothing and simple implements needed by the family. There is no market, and every family aims to produce only enough to last itself and its animals "over winter." Wealth is counted only in flocks and herds, in stores of grain, or in extra clothing.

When, however, civilization develops, occupations differentiate, "population centers" form, commerce becomes established, surplus is produced, and agriculture comes to be a gainful occupation, pursued as a means of wealth. Under conditions such as these, it is possible to establish and maintain an agricultural class that is socially and intellectually equal to any other; and the increasing complexity and difficulty of the profession is a substantial aid to its early and complete establishment. Measured by modern standards, the degree of civilization that may be attained by a people, especially under democratic institutions, will depend very largely upon the class of people that live on the land and on the character of the agriculture they are able to maintain.

CHANGES IN FARMING IN AN OLD COMMUNITY

By *J. Clyde Marquis*

The history of the agricultural industry of the United States involves a knowledge of the development of all the early industries, both commercial and productive. The comparatively recent separation of agriculture, manufacturing and commerce, and the special development of each, follows a long period in which the close relationship and interdependence of these lines persisted. The thought could not be better expressed than in the words of the late T. S. Gold, secretary of the Connecticut Board of Agriculture, 1866 to 1900, who said: "Manufacturing and transportation have had more to do with changes in agriculture than any cause for change in agriculture itself."

For some 175 years from the beginning of settlement in this country, methods and practices in agriculture changed little. Following the opening of the nineteenth century, progress was initiated and proceeded slowly in a halting fashion with many vicissitudes for another quarter century. At this time, or about 1825, began the separation of manufacturing and agriculture and the development of transportation facilities. With the middle of the century came the opening of the great central states farming district and the first years of great agricultural development due to invention and the extension of commerce by means of the steam railway. Coincident with the great western development and the beginning of farming in the central states occurred certain population changes in the old farming communities that had an important bearing on its subsequent progress. These changes can be best understood by an intimate study of a particular country.

The cradle of inland farming in the United States was the valley of the Connecticut river. The banks of this long stream within the boundaries of Massachusetts have witnessed the efforts of a community to thrive by means of the tilling of the soil and a very limited commerce by means of the river. While trading with the Indians in furs, corn, and skins furnished a means of establishing commercial relations with older settlements, the first settlers were primarily farmers. Following pioneer explorations in 1633, a party from Roxbury, Mass., under the leadership of William Pynchon, settled the present city of Springfield, then Agawam, in May 1636. An agreement was drawn up, which is still extant, covering the allotment of lands and outlining the community policy. The land was purchased from the then friendly Indians and a deed secured signed by thirteen leading Indians. Payment was made in some form but the records do not give details. This early deal involved most of the best farming lands of that part of the valley, subsequent purchases from the Indians securing for the whites the other fertile valleys farther up the river.

The early communities were, by necessity, of peculiar arrangement, some phases of which remain until today, giving most New England and New York farming communities those "towns" or "centers" that are yet the units in local government. Interdependence for protection from hostile Indians, together with the lack of efficient means of communication, desire for companionship and a particular political policy, made the "meeting" or "town" house the center and caused the entire community close about it to build homes near to it.

Land system.

The new and striking political policy followed was threefold, involving, (1) freehold land; (2) representative town gatherings or "meetings" as the basis of local government and, (3) obligatory religious observance. The first two points were instrumental in developing independence and personal liberty as well as stimulating individual advancement. These policies were evident in the method followed in the division of land. For the most part the holdings of the town were divided into three classes: (1) Home lots in the center near the "meeting house;" (2) "upland" or rough land adapted to pasturing, and (3) "mowing" or fertile level valley land. The settlers fully appreciated the relative values of these three kinds of land, for the apportionments maintain until today in many communities.

Home lots were most valuable and ranged from one-half acre to several acres, usually with a narrow frontage on the highway or "town green." Even the poorest settler had six to seven acres of meadow and twenty to twenty-five acres of upland. This apportionment of the holdings was usually done at the town meetings, and free holders often had to have the consent of the town before they could make a sale. Had this section been a fertile prairie the apportionment of the two kinds of land would manifestly have been unnecessary; but, with a limited amount of good fertile bottom land, it was necessary that none should gain a monopoly of any entire valley. The value of this land was commensurate with the fortunes of the pioneers. They were by no means poor, owing to incomes from fur-trading with the Indians and some beaver-trapping on their own part. The price of good meadow land ranged as high as twenty-five dollars per acre in some instances, upland being much cheaper.

Farm management.

The early system of farm management under these conditions was definitely outlined by the circumstances. Coöperation in farm work was largely followed and for over seventy-five years cattle were kept in a common herd, cared for by a herdsman paid jointly by the owners of the stock in proportion to amount of stock cared for. This system was followed because of scarce help, a single herd necessitating a single herdsman and the almost entire absence of fences. This same idea was carried out in the planting of corn, which was grown in a common field for many years. The fencing was necessary to keep out the wild animals that had cultivated a liking for the cereal when it had been grown by the Indians, who had also fenced against the marauders.

The early crops were determined largely by necessity. The spirit of experiment was not early manifest, since life to the early settlers was a serious business. Indian corn took first place throughout the days of pioneer agriculture. The Indians had previously become proficient in growing it, often raising crops ranging from 500 to 1,000 bushels in a single locality. They fertilized it with two or three fishes to the hill, and the squaws kept the weeds down thoroughly with clamshell hoes. While the resulting grain was small and often of inferior quality, yet it became an important article of commerce. The remarkable spectacle of fifty large canoes, each loaded to the limit of its capacity with corn and propelled by a swarthy savage, met the eye of the settlers on the banks of the Connecticut in 1637 when Captain Mason brought down, in large shipments, corn purchased from the Indians at the behest of William Pynchon, of Springfield. The fish-manuring was practiced every third year and served to keep up the fertility of the soil. English wheat and peas were introduced into the Massachusetts colonies about 1620, and thereafter remained a staple crop. Turnips, carrots and parsnips were grown before 1639. The first mill to grind corn was built in eastern Massachusetts in 1633 and many were built throughout the state in a few years after that.

Trade.

The beginnings of trade in agricultural products were desultory. Little trade was necessary in a country where every family lived in what was substantially a self-supporting home. The daily necessities were home-made and the only outlet for any surplus was by export to England which was the only open port, commerce being forbidden with other countries. The incentive to produce a surplus was indeed small.

A separation of a city population, who no longer tilled their own home gardens and farms sufficiently to sustain those in public and private service, soon began. By 1640 Boston had become a market for considerable produce, which, however, opened no market for the western Massachusetts settlers except for such staples as could be shipped by boat down the Connecticut and around Cape Cod to Boston. In 1645 the fur business, particularly in beaver skins, began to decline in the Connecticut valley and more attention began to be given to husbandry. The culture of hemp, flax and wool expanded rapidly under the demand for homespuns. This period was characterized by the development of many crops heretofore given only meager attention. Settlements had continued until, in 1660, most of the desirable lands were taken.

Live-stock.

Animal industry was not recognized as a special phase of agriculture until comparatively late in the history of the colonies. In 1652 all ewes or ewe lambs were needed for home breeding and a law was passed providing that none should be exported. By 1662 the total number of sheep in New England had increased until it was estimated at 100,000. Horses were exported in 1656 and in 1680 town legislation relative to exclusion of stallions below a certain standard was enacted. Swine were always an adjunct to the household, largely being confined to the sty and fed lightly on corn. Average weights at Springfield in 1662 were 160 to 200 pounds each. Cured pork commanded higher prices than cured beef.

Horticulture.

The horticulture of the earliest farms consisted in harvesting the wild fruits, which were by no means rare. Wild strawberries, raspberries, gooseberries, cherries, plums of three sorts, grapes, whortleberries and the various native nuts were found. Since there were only 50,000 Indians in the whole of New England to consume them, there was an ample supply. Apples and other European fruits were early introduced and planted. These early orchards, which for the most part were put on rough land and given over to meadows or pasture, were very long-lived and quite fruitful. There are abundant records of 100-year-old trees bearing good fruit, and, in exceptional cases, trees bore fruit after 230 years' growth. Most of the apples were used for cider, which was the favored beverage. As early as 1646 a law on robbing orchards was recorded, showing the existence of plantings worthy of care.

Economic changes in farming.

The changes in farming were comparatively few until after the Revolution. The added stimulant of commercial relations with other countries than Great Britain alone was needed. Land values showed little change from 1660 to 1700.

The period of "homespun" extended well into the nineteenth century, and the extent to which manufacturing was distributed among farmers was very great. In a single town fifteen to twenty-five tradesmen lived and prospered by supplying local needs, few things being brought into the districts except those impossible to produce. These tradesmen included tanners, blacksmiths, cabinet workmen, basket-makers, wagon-makers, broom-makers, carpenters and a score of others. The idea of the division of labor had extended only to the state of the separation of some individuals in each section to do the particular work. Facilities for transportation were necessary to secure success for large centralized manufacturing. The railroad later met this need and brought on the greatest change ever witnessed in the rural sections of a great country. This local trade furnished the needed local markets for farm produce and stimulated the culture of even small farms on the rough and unalluring hills such as fringe the Connecticut valley on both sides in Massachusetts.

The presence of the manufacturing population scattered among the farming communities caused a wholesome growth of population in these districts. The era of separate manufacturing establishments was also the period of maximum population in many of these sections, as subsequent censuses have shown. The total population of the Connecticut valley has made steady gains, from the time of settlement to the present time. But certain towns have carried this gain, and the greatest area of the district has risen and fallen in turn. Of the seventy-one towns in the three counties of Hampden, Hampshire and Franklin, only twenty-three have shown consistent growth to date. The remaining forty-eight have suffered losses and made gains in turn, often owing to local conditions.

In some cases these changes have been very pronounced. In particular may be mentioned certain hill towns that have lost population steadily for over one hundred years. Many of these towns reached their zenith of population between 1800 and 1820. Eleven had a maximum population before 1820, seven more before 1830, and another seven before 1850. Twenty-five out of the forty-eight losing towns reached the height of population prosperity previous to 1850, the beginning of the period of great western development.

The general and popular agitation on the question of abandoned farms did not begin until about 1880, but the depopulation of the rural districts had been going on for half a century. The processes were slow but mighty and not to be checked by any hurriedly planned campaign. The abandoned farm was but one notable feature of an economic change in an old rural country, which needed to have caused no serious concern had its real significance been appreciated. With unmeasured fertile and free lands awaiting settlement, who could condemn the ambitious young yeoman for deserting the rocky hill farm that had been only a moderate success under even more favorable conditions than those confronting him? With a tradespeople at the door to demand the produce, the crude hill farmer could subsist; but, with the centers of working population removed to cities, he must compete with the produce shipped in on rapidly moving trains. The demands and opportunities of manufacturing and the greater profit therein also attracted and held the better class of young men.

The causes of the changes that resulted in the abandoned farm were numerous and varied. In testimony before the Industrial Commission in 1900, some sixteen contributory causes were mentioned by witnesses from various sections. The notable fact, as previously suggested, was that the abandoned farms were almost entirely confined to the hilly sections far removed from railroad facilities and markets, and were almost wholly composed of the poorest and least productive lands, much of which would never have been cleared and cultivated had the good lands of western New York and the Middle West been accessible.

That there was a real period of depression in eastern agriculture about the time of the Civil war needs no proof. The causes of this were to some degree the same that caused the depression in other industries, viz., lower prices, lack of credit, lessening yields on old lands, poor farming, and competition with products grown on cheap and fertile western lands. The abandoned farm may justly be charged to the comparatively quick development of rapid and cheap transportation facilities by means of the steam railway, coincident with the opening of a vast area of the most fertile agricultural lands in the world.

In the details of farm management, changes were slow and largely the result of the broader economic conditions above outlined. While the progressive farmer was constantly developing improvements, the greater proportion of the farmers confined their operations to the old reliable methods, since any venture along new lines that was in the least hazardous was looked upon with much question. Conservatism has always characterized the farmers of New England, generated, undoubtedly, by the danger of failure on those farms which could not possibly yield a large income.

Changes in animal husbandry.

In horse-breeding, progress was steady, stimulated by the patronage of men of wealth. It has never been a general farmer's business and has affected farming but little. The interest in special-purpose breeding began in New England about 1800, the Morgan family being started in Vermont about that time. Horses competed with oxen for farm work, to some extent, but were not extensively used until the era of turnpikes began. Travel then became more general and horses with speed gained favor among farmers.

In 1847, the shows of horses had grown to considerable proportions. In October, 1847, a show was held at Springfield, Mass., called "The First National Exhibition of Horses." The speed element prevailed and there was a notable lack of support on the part of farmers. Up to this time, the horse was the gentleman's animal, since almost all farm work was done by oxen until 1840. The ox has never lost favor in many hill towns, and for heavy teaming is still holding his position as a draft animal. It has been no mere prejudice that has retained this position for the oxen, but rather their adaptability to the needs of farming in a hilly and rocky country. They are able to subsist on grass or hay practically without grain and can be fed to fatness, to be slaughtered when their period of utility as beasts of service is ended.

Cattle-feeding was early a business of considerable proportions in the Connecticut valley. Early feeders used grass, corn and potatoes, but mostly grass. As early as 1789 steers were fed in the valley in Connecticut for New York and Philadelphia markets. Business throve until the beginning of shipments of western beef by refrigerator cars in 1868. Then the production of beef in New England decreased until it is now seldom practiced except in exceptional cases.

Cattle-breeding engaged the attention of the early settlers, and the valley was the home of some noted herds. Extensive operations did not begin until almost 1850, and were with the Devon, Durham and Ayrshire breeds. In 1853 the entire state of Massachusetts contained less than seventy-five pure-bred Jerseys. While many herds of dairy stock have been built up and maintained in New England, the center of beef-breeding early moved westward.

Dairy-farming did not become a separate type of farming until after 1850, except on a few farms near cities. The feeding of beef cattle for market was considered a more profitable business in the richer valleys. Then, too, the demand for dairy products was limited until the railways furnished means for rapid transportation. The first cows, kept alone for home milk-supply, were grazed during the pasture season and fed hay and a little grain during the winter. The grain rations used, however, were limited, and were only given to a few choice cows. Few dairies contained more than six cows. Following the opening of the railroads, however, a great change came over eastern dairying, particularly in New England. Markets were made available and western grain could be shipped in at less cost than it could be grown. Mill feeds began to be used and dairying became largely a manufacturing business, the farm furnishing little except a site for the plant and some hay and summer pasture.

Since 1880, great quantities of western grains and mill feeds have been used in New England dairies, until home-grown grains have almost wholly been neglected. The typical dairy farm of the Connecticut valley now grows hay and perhaps silage enough to furnish roughage for the herd, but the concentrates are all purchased. In many cases this system has worked to the injury of the farmer, since the home farm did not produce enough of the feed to make the business profitable. Large areas have been allowed to continue in grass for mowing and pasture, while the growing of grains, roots, and often corn, has been neglected. More recently the successes of a few far-seeing dairymen have influenced many to abandon this practice of purchasing so much feed and more is being produced at home.

Some lands are such as will not permit of the growth of much grain, and, in such cases, grass alone must be depended upon. The growing of grass without special fertilization or rotation and the neglect of hoed crops has been pointed out as the most unfortunate characteristic of farming in these older communities. During the period of low-priced grains and feeds, the manufacturing type of dairying was quite profitable, but the more recent indications are that a change is being forced upon the farmer. The keeping of cows is growing less profitable on farms that do not produce a large share of the needed feed. If grain cannot be grown, the lands must be sufficiently enriched so as to produce a surplus of hay which will equal the cost of the purchased feeds.

Sheep gained high favor with early settlers owing to the need of their fleeces for homespun woollens, but the history of the sheep industry during the nineteenth century has been one of an almost constant decline. Under the stimulus of high prices for wool (which one time reached one dollar per pound) and the introduction of fine-wool sheep, the industry grew rapidly until about 1800, when it began to decline and failed to recover. Several contributory factors have caused farmers to lose interest in sheep-keeping. Probably none is more frequently cited than the presence of large numbers of dogs running at large, together with the need of effective laws that will protect the sheep-owner. For a time the greater profits in keeping cows influenced many to relinquish the shepherd's crook for the milk pail. After the dairies had once become established, the return to sheep-raising required a radical change, which farmers are loth to make. Sheep stall-feeding for mutton and the growing of early lambs were early practiced but never extensively. The need of sheep in New England has always been noticed by the far-sighted leaders in agriculture. In the words of one, "The full productive capacity of a country like New England, adapted to sheep culture, can never be attained without the sheep."

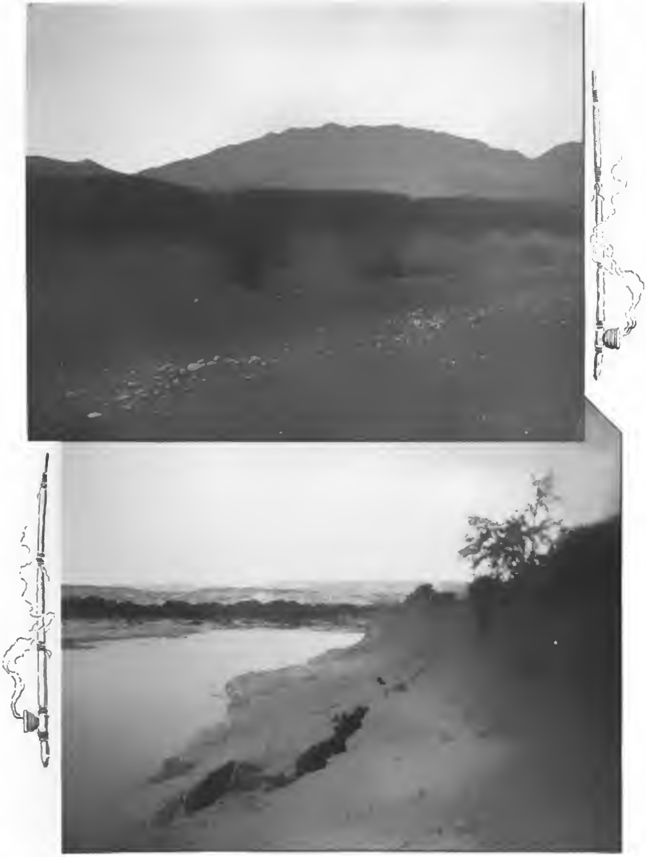

Plate VI Prehistoric irrigation works. Old canals, near Verde, Arizona.

Swine were usually considered a side issue by the early farmers and were given little special attention. They were usually kept in sties or small pens owing to the cost of fences. Stone-walled barnyards were usually the extent of their runs until as late as 1850. The early stock was very poor but better blood was imported about 1800 and many good breeds developed in the old farming sections. Nor have hogs ever become of much importance in the Connecticut valley, except as a means of turning refuse into cash. The economy of pork-production in the great corn-growing states has prevented it.

Changes in crop-raising.

The staple farm crops have also suffered periods of depression and neglect in the older farming communities. Wheat was grown in colonial times but was never an important crop. In 1838, strenuous efforts were made to revive wheat-growing. The Massachusetts legislature offered a bounty on wheat and some 3,642 farmers were paid bounty on 108,570 bushels of wheat. The fertile valleys gave yields of about fourteen bushels per acre.

Potatoes became a general crop in the early part of the eighteenth century, coming into New England by way of New Hampshire. The methods of culture were crude and the system of fertilization poor, resulting in a noticeable decline in yields about 1800. Certain localities have become important potato-growing sections, but in general the crop is grown only for home consumption.

Tobacco became an almost universal crop in certain portions of the Connecticut valley about 1870 and other crops were neglected. This special crop-culture has been well managed, for after twenty to thirty years of this crop these farms are yet giving profitable returns. In a few cases market-gardens have replaced the crop but in the main it has held its own.

The question of soil fertility began to be a subject of much consideration before 1800. Declining yields attracted attention and the chemistry of soils was thought to be the means of giving the needed information. Lime and marls were early used on cultivatable lands and Peruvian guano then came in for attention. This was followed by the first commercial fertilizers. The latter became of sufficient importance to cause the Massachusetts legislature to pass the Fertilizer Law in 1869. Their use has been greatly increased during recent years, until now practically the maximum possible amount is used on the best lands.

The management of farm manures improved as fast as a need of fertility began to be recognized, but its importance has never been adequately appreciated. The basement barn was proposed as a means of saving the manures, and vigorous advocates promoted the idea so thoroughly that, about 1850, almost every farm carrying live-stock had such a manure cellar. The idea was excellent, but in far too many cases the result was a very unsanitary basement in which live-stock suffered when confined.

Special crops have found advocates in every agricultural section, but particularly in these early-settled districts, because of a variety of demands and the nearness of excellent markets. Among the crops that have been the subject of considerable attention are flax, broom-corn, teasels, hemp and onions. Flax was an important crop in the "homespun" period, but its culture declined with the incoming of centralized manufacturers and the greater profits in other crops. Its culture lasted until 1840, in the Connecticut valley. Fuller's teasels were very generally grown in the Connecticut valley and westward to New York in 1830–40. This bur was used to raise the nap on woollen cloths, previous to the introduction of the steel device for that purpose. The most of the supply was grown in Germany, and in 1835 imports to Boston amounted to over $17,730 worth of teasels. Hemp and broom-corn held favor for some time and then were abandoned for more profitable crops demanded by local markets.

Education.

The most recent changes in farming, in these old communities, has been in the farmer rather than in the farm methods. The agencies for the education of the farmer began with the county agricultural societies in 1811, and for a long period these organizations were the only great factors in rural uplift. Following the middle of the last century, other institutions began to aid in the work but, altogether, they reached but a small proportion of the farmers until about 1890. A general awakening then set in which has resulted in marked improvement of intelligence among farmers.

The agricultural colleges are turning out an increasing number of young farmers equipped with enthusiasm and the ability to become leaders in local improvement. The mass of farmers is being reached through the medium of the institutes, better-farming trains, and the extension work of the agricultural colleges. In some localities, colonies of immigrants from foreign rural communities have become successful farmers; but these people present a very serious problem in training for a broader social and civic citizenship. Owing to the decadent condition of the inhabitants of many of the less favored towns, the hope for improvement in these sections lies in the incoming of energetic and capable young farmers from rural districts now becoming over-populated.

With the decreasing supply of public and cheap lands in the West, the attention of more good farmers has been turned to these old communities, with the result that the best farms, in many cases, have been taken over and subjected to scientific management with good results. The new agriculture is finding expression in these old rural communities, with the result that they are fast returning to a stable economic position, and the advantages of handy markets for intensive agriculture are being appreciated. The more settled state of agriculture throughout the United States, as the pioneer days recede into the past, renders improbable subsequent changes of comparable magnitude or significance.

ABANDONED FARMS

By *Frederick H. Fowler*

Beginning about 1875, references began to be made in the press and on the platform, to the abandonment of farm property in the East, particularly in New England. Many of the references that have since been made have been alarming in character and have given the impression of wholesale decadence or abandonment. How many have been based on actual knowledge cannot be estimated. Such abandonment of farms has undeniably taken place, to a greater or less degree, and perhaps may still be taking place in some localities. It has not, however, been of sufficient intensity to warrant alarm, but rather has been an aid in carrying forward a movement, economic in character, that has markedly changed the nature of eastern agriculture.

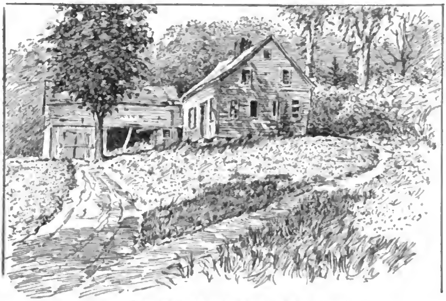

Fig. 40. View of a deserted farmstead in New England.

In a public address in 1889, Professor Brewer, of Yale University, stated that the agricultural depression of New England was not a mere local condition, but part of a great depression of the industry, extending all over Christendom, except in new regions. In his opinion, the real causes were general and economic, not local. He stated that New England farming was changing, but that he questioned very much whether it was declining,—declining in the amount and value of its productions, or declining in its relative profits as compared with farming in other places, or even with many other kinds of business.

During the decade beginning 1889, so much discussion arose concerning abandoned farms that five of the six New England states found it advantageous to issue publications on the subject. Many farms were sold and rented through the influence of these pamphlets. Many of the persons who became interested in these farms, and in some instances became purchasers, were attracted by the advantages surrounding them, rather than by any remarkable fertility of the land. The greater the advantages in the matter of roads, schools, and general transportation facilities, the larger the number of farms that became repopulated. The causes for the vacant houses upon a certain class of farms has been summed up under three heads:

(1) The children left the old homestead for other fields of labor while the parents were in physical condition to manage the farm. Upon the death of the aged parents in later years, they had become engrossed in business on other farms or in other occupations and could not return. In this case, the farms often passed into the hands of heirs and were put on sale.

(2) Many farmers, either with children engaged in other vocations or without children, and who had secured a competency by industry and frugal habits, retired from the farm to the neighboring city or village to spend their declining years. Their farms were then for sale.

(3) Sometimes the owners of farms, seeing only the bright side in other occupations and the dark side in theirs, left the farm for some other business, only to be disappointed. Having raised money to engage in the other business by mortgaging the farm, and not being able to pay off the mortgage, the farm had to be sold.

An examination of available literature bearing on the decadence of eastern rural communities and the abandonment of farms may illuminate the subject. Much of such literature found in the daily press, in magazines, and in political speeches, may be thrown aside as of slight historical or economic value. Other material, especially that furnished by officials investigating and reporting under state authority, contains a great deal that is illuminating and instructive. For purposes of convenience and comparison, the several states involved may be considered separately.

Maine.

This state has not made an official inquiry into the subject of abandoned farms, but it is assumed that the conditions existing in other New England states have been true of Maine also, although perhaps not so pronounced.

W. W. Thomas, Jr., Commissioner of Immigration for the state of Maine, in a report made about 1870, stated that their young men wished to be lawyers, doctors, ministers, traders, brokers or factors of the farmers, laborers and bona fide producers of the country; that their youth left the old homestead, and not finding sufficient producing population in the state to support them in their callings, went west, where the producers were settling by thousands, and where, on their thrift, professions and trades might also thrive. The result was that the rural population of Maine was decreasing, and much, if not the greater part, of their farming lands were neither more fertile nor more valuable than they were ten years before.

New Hampshire.

Agreeable to a recommendation made by Governor Goodell in his annual message to the legislature, an act was passed at the session of 1889, entitled "An act for the development of the agricultural resources of the state through immigration and other means."

As soon as practicable the commissioner, N. J. Bachelder, addressed a circular letter to the selectmen of every town in the state, accompanied with a blank for their report. The principal inquiry was for names and addresses of owners of abandoned farms, on which were buildings that would afford a comfortable home for the occupant. Returns were received from 212 towns, of which 154 reported 1,342 abandoned farms with tenantable buildings. The report stated that from August 24, 1889, to August 12, 1890, 141 abandoned farms were sold and reoccupied, and that 160 were reoccupied by tenant or owner, but not resold.

Vermont.

In 1888 the legislature of Vermont passed "An Act providing for the appointment of a commission to investigate the agricultural and manufacturing interests of the state and devise means to develop the same."

In his report, in 1890, Commissioner A. B. Valentine stated that more than one thousand farms in Vermont, formerly under cultivation, were at that time abandoned for farming purposes. One-half of these farms had buildings that were in fair condition. Of the lands once cultivated but at that time unoccupied for farming purposes (not including the timber lands and those attached to other farms alluded to), a large part were of good soil, not worn out, and could be made as fruitful as the adjacent lands which were being successfully cultivated. He admitted, however, that parts of the abandoned lands were rocky, badly located, and in some instances worn out. This was true, in a few cases, of nearly whole townships.

In this report a brief statement as to the commencement of the exodus, its continuance and results, was given. Many of the reasons adduced for abandonment were shown to be erroneous. The exodus really began years before the alleged causes existed. As early as the year 1837, a perceptible diminution of cultivated acres was observed, and 1840 found the tide from the state fairly in motion. This was coincident with and following the great panic of 1837, when manufactories of iron and textile fabrics, then in their infancy, were closed; business stagnated, and the home market for farm produce was greatly curtailed.

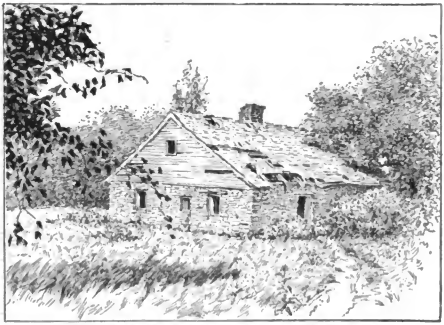

Fig. 41. An unoccupied farmhouse among the hills of New England.

The general government offered public land to settlers at such a nominal price, and new states held out such extraordinary inducements that many of Vermont's best citizens and most successful farmers regarded it to their interest to avail themselves of the offers. The movement westward increased in volume during the two decades that immediately preceded 1860, and afterward, until it seemed as though portions of the state would become depopulated. The stage routes had determined to a great extent the location of the early settlers, and the introduction of railroads later on tended to attract the people who had settled the hills to the valley and to the railroad centers.

Another reason for abandonment was that the Civil war called from the state to the Union army over 34,000 men—young, vigorous men, thousands of whom died on the field of battle, and thousands of whom were grievously wounded, and many other thousands, with a little money saved, did not return to the homes of their fathers, but drifted to the village, and city, or to the far West, to take advantage of the act of Congress, which made the period served in the army count on the time required to secure a quarter section for a homestead. Their fathers, with no children at home to lean on in old age, followed their sons to the West, or died, leaving none to fill their places. It has been estimated that not one-half of those who entered the army from Vermont ever returned as permanent residents.

In 1895, the statement was made that the number of unoccupied farms had been reduced by one-half, and that there was less anxiety on the part of owners to sell. In the following year the towns reporting an advance in value of farms, as compared with other years, were generally those favorably located, usually near some large manufacturing interest. Those in which a lower value were reported were smaller towns remote from the railroad. It was then generally thought by business men that investments in well-located farms in Vermont, at prevailing prices, were safe. The tendency toward lower values that had been going on for the preceding twenty years seemed to be checked.

In 1893, George F. Wells reported[1] a general increase in the volume of farming operations from 1850 to 1880, and an important general decrease in farming since 1880. The causes of this change were given as: (1) The rapid growth of urban industry and population in twenty years; (2) the more intensive type of farming in vogue; and (3) the economic pressure exerted upon farming in the extreme rural districts through the effects of deforestation and of depopulation.

Mr. Wells stated several deductions that seemed warranted by the discussion of population status: (1) A large majority of Vermont towns, and a larger majority of the rural towns, were decreasing in population; (2) the increase towns were increasing at twice the rate that the decrease towns were decreasing; (3) the small towns, generally speaking, were the decreasing towns; the smaller, more isolated communities were decreasing extremely; (4) the majority of Vermont towns—particularly the average rural ones—were at a comparative standstill, and only a few had changed greatly within the decade. He expressed the opinion that a final conclusion for the total economic status of rural Vermont was hard to give. Many towns had increased. The more extremely rural towns had greatly declined. Some industries had died out; others had flourished. On the whole, the total economic status of rural Vermont was considered to be rising.

Massachusetts.

The Bureau of Statistics of Labor, in 1890, gathered and published exhaustive statistics concerning abandoned farms. The following definition was placed on blanks sent by Chief H. G. Wadlin to the assessors of the several towns:

"By 'Abandoned Farms,' in this inquiry, are meant those formerly cultivated but now deserted, upon which cultivation is now abandoned, and the buildings, if any, unoccupied and permitted to fall into decay. In some cases the grass is still cut on these farms, but nothing is done in the way of enrichment of the soil, and the land is practically unproductive and left to run wild."

Farms upon which cultivation was at a low ebb, as compared with former days, were not considered as abandoned and were therefore not within the scope of the inquiry. Abandoned farm land was found to be principally confined to the western counties, and aggregated 3.45 per cent of the total farm acreage of the state, outside the limits of cities, and about 0.87 per cent of the value of such farm land. A total of 1,461 farms were reported as abandoned, of which 689 were without buildings and 772 with buildings.

While some of the towns containing abandoned farms showed a recent decline in the value of agricultural products and property, this was overbalanced by increase in others in the same county, so that, notwithstanding the existence of abandoned farms, every county except Nantucket has shown an increase since 1875 in the value of agricultural products and property. In some counties, also, an increase in the acreage under cultivation appeared. In the towns containing abandoned farms, and having no important manufacturing industries, a decline in population generally appeared. The size of the farms in the commonwealth was gradually increasing while their number was decreasing. The farms that were abandoned were those of least value. In 1891, 135 of the 351 cities and towns in Massachusetts reported 887 abandoned or partially abandoned farms. For several years Secretary Sessions of the State Board of Agriculture carried on the work of reoccupancy, with gratifying results.

Rhode Island.

The State Bureau of Industrial Statistics investigated the subject of abandoned farms in 1892, as it was considered a proper one for investigation and research, it being at that time a matter of great public concern. The returns as to abandoned farms were made principally by the assessors and town clerks of the several towns, and all were verified to ascertain their reliability. The description of an abandoned farm was the same as that used by the Massachusetts Bureau of Statistics of Labor.

There were 482 farms reported, 298 with buildings, and 184 without buildings. The abandonment was found to be 8.76 per cent of the total farm land as shown by the census of 1885; while the increase in value of all farms from 1875 to 1885 was 18.78 per cent; and the increase in value of the agricultural production in the same period was 50.68 per cent.

Connecticut.

In 1892, T. S. Gold, Secretary of the State Board of Agriculture, stated that some farms in Connecticut had been abandoned because, from location or otherwise, they ought to be abandoned; their legitimate use being for growing wood and timber, rather than general farming; that diversion of travel and removal of small business centers and small manufacturing industries had caused some property once occupied to be no longer in demand; that in other cases the owners had preferred to let houses and lands remain unoccupied —"abandoned" as far as occupancy was concerned —rather than be at the expense of repairs to fit the place for a tenant, or even to persuade themselves to a sale to some chance customer who might offer. In other cases, the death of the owner, or other family circumstances, placed on the market much very valuable property. There were in some sections small farms very desirable as residences, from which the owner, who used to follow some trade, had removed to the village or city, gaining only a part of his support from his farm; and in some towns these places, as they came on the market during the preceding fifty years—for that period covered about the time of this change—had been bought up and absorbed by the larger farms, used for pasturage or the growth of wood; in others they remained as separate holdings, and were offered at very low prices.

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[1] "The Status of Rural Vermont."

New York.

The Bureau of Information and Statistics of the State Department of Agriculture, in 1906, called attention (Bulletin No. 1) to information concerning the agricultural lands and the supply of agricultural laborers in the state as reported by supervisors. Information was sought concerning the number, location, size, conditions of soil and buildings, price, and the like, of all unoccupied and partially worked farms in the state on which production could be increased; the reasons for their being unoccupied and unworked, and how many farm laborers could find profitable occupation in the state.

Descriptions of some 1,700 farms of all kinds in all parts of the state were sent out together with a description of the agricultural conditions in the state, markets, transportation, products, and other factors. From supervisors' reports and personal observation, it was thought there were 20,000 farms for sale. Nearly all were offered at such low prices and on such favorable terms as to make them available for any one desiring to engage in agricultural pursuits or have a farm home. The soil of these farms was not exhausted, but, on the contrary, was, with proper cultivation, very productive. Nearly all were said to have good buildings and fences and to be supplied with good water and plenty of wood for farm purposes, and in nearly all cases had apple and other fruit trees.

The reasons for the general complaint of unsatisfactory conditions of agriculture in the state were not difficult to discover. The great expansion of business in all lines during the preceding decade had in a large measure drawn the young men and women from the farms. Moreover, many western states, Canada, and many railway and land companies by advertising throughout the world free or cheap farms in the West, and by organized effort, with the assistance of steamship and railway companies, had turned westward even those aliens who would naturally have come to the agricultural sections of New York.

General statement. (See also page 99.)

It is assumed that conditions similar to those noted have prevailed, are prevailing or may prevail in many other states, but official information pertaining thereto is difficult to obtain. Newspaper articles, however, seem to indicate that abandoned farms and decadent towns have not been confined to the states named.

It has been well said that the general story of a great agricultural retrograde is only half the story. The decline of manufacturing industries in the hill villages more than equals the decline of agricultural industries. The proportion of abandoned wagon shops, sawmills and other mechanical trades that were once the life of flourishing villages has kept pace with the abandonment of the farms. Many villages in which the manufacturing interests were once prominent locally, have practically passed away, while the value of agricultural land and products is as great now, or even greater than when those manufacturing industries were flourishing.

The giving up of small shops in rural communities coincided with the centering of manufacturing in cities and large towns. Railroads, which naturally followed the valleys, favored the centers of population and no doubt assisted in drawing many workingmen and their families from the hill towns into the new manufacturing centers. One result of this movement was the lessening of the local or home market for farm produce. This unfavorable condition, from the farmer's standpoint, was intensified by western competition helped on by discriminating transportation rates.

Another result of this shifting of population was the drawing of vigorous and ambitious young people from these hill towns into localities where better social and educational conditions prevailed. This resulted without doubt in lowering the intellectual, moral and social standards in many rural communities. Sociologists have pictured very bad resultant conditions, and it is conceded that in some cases they have been bad enough. However, crimes committed in sparsely settled communities, if exploited through the press, may be regarded as much more heinous than when committed in centers of population. The same may be true of ignorance and lack of thrift. May it not be that the standard set for those who live in rural communities is higher than that set for their brothers and sisters in crowded cities?

What census statistics show.

Census statistics throw some light on the extent and influence of the movements described. The states named in the following tables do not appear especially decadent, although the increase in population noted may be credited, very largely, to the cities and larger towns. The agricultural statistics do not indicate that the industry is losing ground to any appreciable degree. It is assumed that while census statistics may not be absolutely accurate, they are at least indicative of facts:

STATISTICS OF POPULATION.

State	1860	1880	1900
Maine	628,279	648,936	694,466
New Hampshire . . .	326,073	346,991	411,588
Vermont	315,098	332,286	343,641
Massachusetts	1,231,066	1,783,085	2,805,346
Rhode Island	174,620	276,531	428,556
Connecticut	460,147	622,700	908,420
New York	3,880,735	5,082,871	7,268,894

VALUE OF FARM PROPERTY, INCLUDING LAND WITH IMPROVEMENTS, IMPLEMENTS AND MACHINERY, AND LIVE-STOCK.

State	1860	1880	1900
Maine	$97,424,385	$123,805,039	$122,410,904
New Hampshire . . .	83,297,400	88,715,693	85,842,096
Vermont	114,196,989	130,811,490	108,451,427
Massachusetts	139,888,690	164,288,956	182,646,704
Rhode Island	22,179,388	29,039,046	26,989,189
Connecticut	104,480,565	135,185,834	113,305,580
New York	936,366,584	1,216,637,765	1,069,723,895

VALUE OF FARM PRODUCTS.

State	1880	1890	1900
Maine	$21,945,489	$22,049,220	$37,113,469
New Hampshire . . .	13,474,330	13,761,050	21,929,988
Vermont	22,082,656	20,364,980	33,570,892
Massachusetts	24,160,881	28,072,500	42,298,274
Rhode Island	3,670,135	4,218,300	6,333,864
Connecticut	18,010,075	17,924,310	28,276,948
New York	178,025,695	161,593,009	245,270,600

A recent publication by the United States Department of Agriculture on "Changes in Farm Values," covering the years 1900 and 1905, indicates a considerable gain in the values in these northeastern states.

The outlook.

Opinions as to the outlook for eastern agriculture will doubtless vary with the standpoint of the individual, but there is foundation for saying that the future looks bright with promise. Agriculture is the foundation industry, and increasing populations must be fed, housed and clothed. The farm, somewhere, must be depended on to supply most of the needed materials, and eastern consumers must depend more and more on eastern producers. The many advantages offered by the East do not weigh lightly when compared with those offered by other sections of our great country. The time will come, no doubt, when the hills of New England will again be covered with valuable forest growth or with flocks and herds.

Improved methods of transportation of farm products, a more righteous distribution of the burdens of taxation, increased appreciation of good home markets, and a growing conviction that the climate and soil of the East, which, while not perhaps all that could be desired, can be depended upon to furnish a comfortable living to the farmer's family, if the family will do its part, are even now making farmers more prosperous and contented in this region.

The extension of educational facilities through public schools, higher institutions of learning, public libraries, and other agencies, is affording ample opportunity for country people to gain mental improvement. Social life is being quickened by extension of church and grange influences. The equipping of farmhouses with electric lights, telephones, and other modern conveniences, together with free rural delivery of mail, trolley lines, state roads, and improved highways, automobiles, and other contrivances,—all these are doing away with that isolation, so pronounced and depressing in earlier days. The occupation and improvement by city, business and professional men of farms once abandoned or partially abandoned has greatly aided, in many a country community, in solving the problem of what use to make of such farms in some cases.

These and other conditions and influences, combined and working together, will more than restore any lost prestige, and will make the abandoned farm merely an incident in history, a condition to be referred to by future economists, but happily having no meaning to the cultured and prosperous agriculturists of that day.

THE NEGRO FARMER

By *Booker T. Washington*

A little more than one-half (52.7 per cent) of the 3,992,337 negroes in the United States, employed, according to the census of 1900, in "gainful occupations," were engaged in farming. Of this number, 1,344,125, or 33.7 per cent, were employed as farm laborers, and 757,822, or 19 per cent, were overseers or independent farmers, either owning or renting the land they cultivated.

As a rule, the negro farmer and farm laborer live now, as before the war, in the South and Southwest. Not more than 3 per cent of the negro farmers are in the northern states. Although large numbers of negro laborers have gone North in recent years, the majority of them have emigrated to the great cities in the North and East. Generally speaking, then, it is in the South that the negro is a farmer.

The 746,715 farms operated by negroes in the United States in 1900, contained 38,233,920 acres, or 59,741 square miles, an area about equal to that of New England. A little more than one-third (35.8 per cent) of that land, that is, 14,964,214 acres, or 23,382 square miles, was owned by the men who farmed it, and this is an area nearly as large as the combined territory of two European states,—Belgium and Holland. So much has been achieved, forty years after emancipation, by the negro farmer, of all men in this country, perhaps, the most neglected.

Land ownership and tenancy.

The percentage of farms owned as compared with those rented varies greatly in the different southern states. In West Virginia and Oklahoma, the percentage of owners is 72 and 71 per cent respectively, as compared with the tenants. In Virginia, Maryland, Indian Territory, Florida, it varies from 59.2 to 48.4 per cent. It is lowest in Georgia, Alabama, Louisiana and Mississippi, ranging from 13.7 per cent in Georgia to 16.3 per cent in Mississippi. These states are in the heart of the Black belt, and negroes make up from 45 to 60 per cent of their total populations. Collectively they contain more than one-third (38.8 per cent), according to the census, of the total negro population of the United States. The fact is, then, that negro farmers are owners in inverse ratio to their numbers in the surrounding communities. Where negro farmers are concentrated, namely on the black soil of the cotton-belt, there they are for the most part tenants or merely farm laborers.

The explanation of this condition is to be found in the history of southern cotton culture. The concentration of the negroes in the region of the big plantations began as far back as 1820, as soon as cotton had come to be the staple crop of the southern states. As the soil in the older states was exhausted, the region of the large plantations shifted steadily south and west. Meanwhile, the plantations increased in size and the slaves came more and more into the hands of the few large owners and capitalists.

Status of the negro.

In 1860, slave-owners constituted a little more than 5 per cent of the white population of the South. This resulted, after the emancipation of the slaves, in what would have been a wholly anomalous situation in a country where there was free individual competition; it left the poorest element in the community occupying the richest and most productive part of the land. This condition has been continued since the war, because the conditions that produced it have remained practically the same.

The change in the political status of the negro did not at once change, to any great extent, the actual relations between the former master and the former slave. Under the crop-lein system, the relations of slave and master were changed to that of tenant and landlord, but the negro laborer still looked to the owner of the land to furnish the capital necessary to carry him through the season of planting and harvesting, and he still submitted to an amount of direction and control in the operations of his farm to which no independent farmer would be disposed to submit.

But while the actual conditions on the plantation were not immediately altered by the change in the legal relations of the slave and master, the way was opened for a slow and gradual improvement.

When freedom came to the plantation, it found the slave without education, without property and without the habit and tradition of self-direction and self-control. In practice, freedom meant to freedmen on the plantation merely the liberty to change masters, that is, to move from one plantation to another. This liberty he used, and the disposition to move from one place to another grew, in many cases, to be a vice that greatly impaired his usefulness as a laborer and increased the cost of conducting the plantation for both landlord and tenant. But the freedman's earnings, such as they were, were his own. He could now own property in his own right. Gradually he learned to make use of that privilege.

The history of the former slaves who now own their own farms, in nine cases out of ten, is that after emancipation they drifted aimlessly about for a number of years, before the idea fairly dawned on them that they could and should become their own landlords.

At the present time, however, there is growing up among the negro farmers a class of men, who have that hunger for the land, and that tenacity in holding fast to it, that has characterized the peasant class in every country in which it has existed. This class, which constitutes a real peasantry, have been produced at once by natural selection, and by training in the hard school of experience. These men constitute, at the present time, a permanent and substantial element in the drifting and unstable mass of negro farm laborers and tenant farmers, and if they are able to transmit to their descendants their lands, their thrift, shrewd sense and habits of industry, they will become, in the course of the next half century an important factor in the economic development of the South.

An indication of the part which the negro farmer plays in the agriculture of the United States is the fact that, while negroes constitute less than one-twelfth of the population of the United States, they conduct, either as owners, tenants or managers, 13 per cent or about one-eighth of the farms, and raise 5.4 per cent of total farm products of this country, measured by their market value. In the South, the negro, constituting about one-third of the population, conducts about one-fourth of the farms. He controls about one-tenth of the total acreage, and raises about one-fifth of the agricultural products. Over one-half of the farms in Louisiana, Mississippi and South Carolina are conducted by negroes. In Alabama and Georgia, they conduct a little less than half, and in Virginia, Arkansas and Florida between one-third and one-fourth.

The majority of the negro farms are small—between ten and fifty acres—just about what one man, with his wife and family, with the aid of a single mule, are able to cultivate. But there is a considerable number of individual farmers who own 500 and 1,000 acres and sometimes more. In Vermont, the two Dakotas and New Mexico, the negro operates a larger average acreage than the white farmer. It is estimated that the total value of farm land and property owned by negroes amounted in 1900, at the time of taking the census, to $102,022,601. In the state of Georgia, negroes pay taxes on 1,075,073 acres. The gross value of the annual products of the farms of colored owners was, in 1900, $67,132,380.

The principal crop cultivated by the negro—his "money crop"—is cotton. The negro cultivates one-half of the cotton farms, one-third of the rice farms, one-fifth of the tobacco, and one-seventh of of the sugar farms. He produces almost two-fifths of the cotton, one-fifth of the sweet-potatoes, and about one-tenth of the tobacco and rice. The negro farmer has, as a rule, very few farm animals. Usually he owns a mule, after that, a pig, and chickens, and finally a cow.

Progress of the negro farmer.—The progress of the negro farmer in the South has been slow, but it has, apparently, been permanent. No labor has yet been found to replace that of the negro upon the plantations; his hold upon the soil has steadily increased from year to year. It is remarkable, considering the difficulties under which he has labored, his small earnings, his ignorance, timidity and lack of training, that the despised "field-hand" has been able to make himself to so large an extent as he has a land-owner.

Not the least remarkable of the achievements of these men has been the building up in farming districts of negro towns like Mound Bayou, Mississippi and Boley, Indian Territory, in which they have not only their own churches, stores, and schools, but their own banks, courts and town councils, in which they have the opportunity to gain a knowledge and training in self-government which they cannot at present obtain elsewhere in the South.

Efforts to assist and direct negro tenant farmers to become land-holders have met with considerable success in recent years in different parts of the South. Notably is this so at Calhoun, Alabama, where the work has been carried on under the direction of a plantation school, founded by a number of former teachers from Hampton Institute. The Southern Improvement Association, located near Tuskegee Institute, has succeeded during the past six years in disposing of a tract of some 4,000 acres to negro farmers, who, working under the direction of an agent of the company, have been able, within a period of about five years, to pay for farms of from forty to sixty acres, with the model buildings, erected by the company.

In the present unsatisfactory and unstable condition of agriculture in the South, the success of these and other individual experiments that are being tried is likely to throw more light upon the future of the negro farmer in the South than anything that can be learned from the more general investigations of statisticians.

THE INFLUENCE OF MACHINERY ON THE ECONOMIC AND SOCIAL CONDITIONS OF THE AGRICULTURAL PEOPLE.

By *H. W. Quaintance*

In treating of the influence of farm machinery on the farming classes, we should bear in mind the important fact, that what is at one time properly to be classed as farm work is not necessarily so to be classed at another time. A change in the classification of work means also a change in the classification of the workers and of the tools or machines with which they work.

How great this change has been in the United States in the thirty-year period from 1870 to 1900 will be apparent from a consideration of the figures showing the percentages of the total population (male and female) engaged in gainful occupations in the several classes at the dates named:

Year	Agriculture	Professional service	Domestic and personal	Trade and transportation	Manufacturing and mechanic arts
1900	35.7	4.3	19.2	16.4	24.4
1870	47.6	3.0	18.2	9.8	21.4

This decrease in the percentage of those engaged in agriculture from 47.6 per cent to 35.7 per cent was equivalent to a withdrawal of 3,459,819 persons from agriculture and their distribution among the other classes. For the United States as a whole, and for the several geographical divisions, the percentage of increase or decrease in the several occupation classes during the period named was as follows (Am. Econ. Ass., 3d Ser., Vol. 5, p. 835):

	Agriculture	Professional services	Domestic and personal services	Trade and transportation	Manufacturing and mechanic arts
United States	—11.9	1.3	1.0	6.6	3.0
North Atlantic division	—12.4	1.4	0.2	7.6	3.2
South Atlantic division	—13.0	1.0	2.5	4.6	4.9
North Central division	—15.9	1.6	1.7	8.1	4.5
South Central division	—8.1	0.7	1.2	3.8	2.4
Western division . . .	0.1	2.6	—3.6	7.0	—6.1

The introduction of machine power increased the efficiency of the workers, increased the output of farm products, caused a fall in the price per unit of product, and hence a redistribution of the working force of the country.

By this movement those who left the farms found more desirable employment in the cities, and those who remained were relieved of what would otherwise have been a superabundance of workers. Both these groups and those formerly in the cities have profited by the lessened cost of food and of other farm products. Taking the United States as a whole, i. e., continental United States, the efficiency of the average farm worker in the year 1900 appears to have been nearly 86 per cent greater than in the year 1870.[1] Of nine of the more important farm crops, in the production of which machinery is much used, the average increase of efficiency during the period from about 1830 to about 1895 was nearly 500 per cent. In the case of barley, the estimated increase in efficiency is 2244 per cent.[2]

During the period from 1840 to 1900, in the case of the eight principal cereals,[3] the rate of production of farm products far outran the rate of increase of the population, being in the last-named year nearly twice as great in proportion to the population as it was in the first-named year.[4] This was so, in spite of the fact that during the last thirty years alone, of that period, as above indicated, the agricultural industry suffered a loss of nearly three and one-half million workers.

It is difficult, if not impossible, to trace definitely the influence of machinery upon the economic and social condition of those remaining on the farms, machine power being only one of many different forces contributing to the betterment of conditions and without any one of which such bettered conditions would have been practically impossible. A few effects may, however, be traced with tolerable certainty.

Assuming, what is certainly true, that the farmer is to be classed rather as a manufacturer than as a miner[5] and that his profits are a function of his investment, we may infer a greatly improved economic condition from the increase in the average size of farms in the regions where machinery is much used, as compared with the average size of farms in the regions where machine power is comparatively little used.

The average size of farms of ten acres and over in the North Central division in 1880 was 51.5 acres. In 1900, this had changed to 73 acres,—an increase of 41.8 per cent. In the South Atlantic division, the average size of farms in 1880 was 36.2 acres. In 1900, this had changed to 29.4 acres,—a decrease of 19.1 per cent. It will be readily recognized that these sections represent the extremes in the matter of the use of farm machinery and that the North Central division is the one in which the use of farm machinery is especially prominent. In the seven leading cereal-producing states,[1] the average farm acreage increased, during the same period, from 64.4 acres to 102.5 acres,—an increase of 59.2 per cent. The average acreage in crops per person cultivating them in the same states and during the same period increased from 40.6 acres to 62.4 acres,—an increase of 53.7 per cent.[2]

A more definite, and in some respects the best available, index of the changes in the economic condition of the farmers is derived from the "Average Value of Farm Property, Including Land with Improvements, Implements and Machinery, and Livestock," published in the Twelfth Census Report on Agriculture, Vol. 1, p. 695. The figures as they are given take, however, no account of variations in the purchasing power of money and are, therefore, somewhat misleading. For the purposes of this study, I have chosen to rely on Sauerbeck's index numbers of the purchasing power of money, and present herewith a table of the average value of all farm property in continental United States on the several census years, 1849–1899. These figures are given both as reported by the Census Office and as reduced to the basis of Sauerbeck's index numbers, together with other figures showing the per cent which the average value on the several census years succeeding that of 1849 (as resulting from the application of Sauerbeck's index numbers) is of the average value reported for that year:

Year	Average value of all farm property according to		Per cent of average value in 1849
	Census report	Sauerbeck	
1899 . . .	$3,563	$3,877	142
1889 . . .	3,523	3,621	132
1879 . . .	3,038	2,709	99
1869 . . .	3,363	2,539	93
1859 . . .	3,904	3,073	112
1849 . . .	2,738	2,738	100

From the foregoing table, it appears that the average farmer was 42 per cent better off in 1899 than he was in 1849. That is, his power to command goods in the general market was as much greater in 1899 as it would have been in 1849, had he then had 42 per cent more of this world's goods.

The several percentages resulting from similar calculations for the several geographical divisions and for the three northern divisions grouped as one are shown in the following table:

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[1] Publications American Economic Association, third series, Vol. 5, pp. 815–817.

[2] Publications American Economic Association, third series, Vol. 5, pp. 817–821.

[3] Corn, wheat, oats, barley, rye, buckwheat, rice, and kafir.

[4] Publications American Economic Association, third series, Vol. 5, p. 811.

[5] Twelfth Census Report on Agriculture, Vol. 1, p. cxxxvi.

[1] Illinois, Iowa, Kansas, Nebraska, Minnesota, North Dakota and South Dakota.

[2] Publications American Economic Association, Third series, Vol. 5, pp. 851–853.

VARIATIONS IN INVESTMENTS IN ALL FARM PROPERTY, FOR CONTINENTAL UNITED STATES AND FOR THE SEVERAL GEOGRAPHICAL DIVISIONS, FOR THE PERIOD 1849–1899, AS DETERMINED BY THE APPLICATION OF SAUERBECK'S INDEX NUMBERS OF THE PURCHASING POWER OF MONEY.

	1849	1859	1869	1879	1889	1899
Continental United States	100	112	93	99	132	142
North Atlantic	100	99	108	119	135	138
South Atlantic	100	111	53	51	64	58
North Central	100	123	132	153	218	273
South Central	100	147	55	54	74	76
Western	100	115	154	232	395	314
North Atlantic, North Central and Western	100	105	111	126	173	202

The real import of the foregoing figures may be much more readily comprehended from an inspection of them as presented in the following chart:

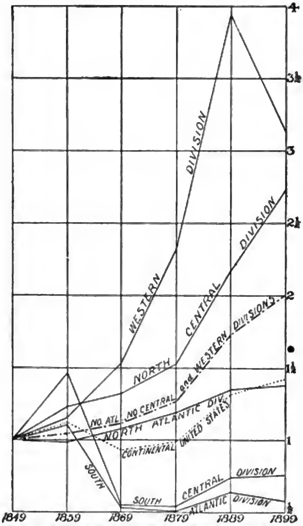

Fig. 42. Relative value of all farm property per farm in continental United States and in the several geographical divisions for the period 1849-1899, according to reports of the United States Census Office and Sauerbeck's Index Numbers of the purchasing power of money.[1]

The chart demonstrates the fact that, apart from the destructive effects of the Civil war, the farmers of the country have prospered greatly, and that the progress in this regard is most marked in the regions devoted largely to cereal production, and in which machines are therefore much used. For the three northern divisions—the North Atlantic, North Central and Western—where the effects of the Civil war were least and where farm machinery has been most in use, the increase has been 102 per cent. In other words, the average farmer in that section was a trifle more than twice as well off in 1899 as in 1849,—an advance in general economic welfare of over 100 per cent within a period of fifty years. This certainly is phenomenal in the history of the world's farming population, which, until the beginning of the nineteenth century, had hardly advanced from the status in which the dawn of history found it. Considering only the North Central and Western divisions, which are more especially machine-using divisions, the advance has been approximately 200 per cent. Doubtless, as already intimated, much of this advance is due to other causes; but machinery is by far the most important of the elements that have come in to modify the condition of the farming population and to it should, therefore, be given the greater measure of credit.

Influence on social status.

The social conditions resulting from the use of machinery are even more difficult to trace than are

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[1] The decided drop in the South Atlantic and South Central divisions challenges attention. The writer ventures to say that although much of this drop is due to the effects of the Civil war, another very great part is due to the change of slaves to freemen and to farm proprietorship, without there being in fact any marked change in the total farming population except the normal increase. The continuing movement, quite marked in the southern states, from the farm-laborer to the farm-proprietor class tends further to obscure the real advance.

The strong upward movement of the line representing the Western division for the decade 1879–1889 and the marked fall in the succeeding decade, requires some consideration. The Census Office insists that the slump in 1899 is accounted for by the discussion presented in the Twelfth Census Report on Agriculture, Vol. 1, pp. xxv–xxix. The only portion of that discussion bearing upon the point under consideration is as follows: "The average value of farm land in the . . . western states was less than it was ten years before. This was due, not to a decline in farm values, but to the inclusion in farms of vast areas of cheap land formerly a part of the public domain. It is possible, also, that in 1890 the enumerators returned too great a value for farm lands, or that in 1900 the values the economic. Yet, even here, some measure of the truth may be indicated with approximate certainty. Whatever the social conditions of a people may be at any given time, they are largely the product of wealth and intelligence. That the farmers of the United States have advanced in material welfare has already been shown, and this advance has been, and is, a pre-requisite to intellectual growth and social attainment. For, "as long as every man is engaged in collecting the materials necessary for his own subsistence, there will be neither leisure nor taste for higher pursuits."

That the use of machine-power stimulates mental growth and activity, even in the operator himself, is too clear to require demonstration, for the men who work most with machines are among those properly classed as the most intelligent.

It has already been noted that, principally as a result of the introduction of farm machinery, the agricultural population of the United States decreased from 47.6 per cent of the total population in 1870, to 35.7 per cent in 1900. The urban population classes have increased, of course, by the same amount. This has been good in some respects, at least, for, as Burroughs says: "A nation always begins to rot first in its great cities; is, indeed, always rotting there and is saved only by the antiseptic virtues of fresh country blood."

Among those who have continued on the farms, socialization has become a struggle for place against greater and constantly increasing odds; and this, too, in spite of the fact that not only the general level but also that of the lower classes is much higher than before. If we look to the proprietor, or independent class of farm workers, we shall find a great difference between the farmer of the period just before the introduction of machinery and the farmer of today. The life of the former was characterized by isolation. Coöperation was limited largely to house-raisings and husking-bees, and these were so infrequent as to be real social events.

Self-sufficiency is no longer the ideal. The farmer has become a specialist, devoting himself to particular branches of farm work, as stock-raising; dairying; potato-, corn-, or wheat-culture; or to the raising of fruits, vegetables, cotton, or tobacco, having in mind to secure the other things for which he has need by means of exchange. The farmhouse is no longer isolated. Good roads, the free delivery of mails, the telephone, and the electric car lines bring the farmhouse into the very suburbs of the city.

The home is supplied with conveniences undreamed of by the farmers of fifty years ago. The farmer and his wife are no longer to be set aside as "from the country." They are people of consequence, and their voices are heard in institutes, in club and federation meetings, and at the polls,—the man everywhere and the woman also in some states. What they say is listened to with the respect due to one who knows whereof he speaks. The farmers are coming forward, also, as members of the state legislatures and as governors of states; and many of those who lead in national affairs are proud to claim some farmstead as the place of their early training. They are practical politicians, and if less crafty are also less unscrupulous than their associates from the cities. In international affairs, also, the farmers as a class have much control; for nations that depend upon America for their food supply will not lightly engage in war against us, and all from whom we buy will suffer much rather than offend us.

Influence on labor. (See Powers, Chapter V.)

But there is another phase of farm life, the social import of which must not be overlooked. Along with the increasing wealth, home comforts, and influence of the proprietor class, there has been an increase also in the material welfare and general intelligence of the farm laborers. But, where machine power is used, the laborers have not advanced as rapidly as have the proprietors. According to reports of the Department of Agriculture, the average money wages of farm workmen per month, with board, was $10.43 in 1879, $12.45 in 1890, and $14.07 in 1899.[1] Converted

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reported were too small. The latter is more probable than the former, owing to the fact that in 1900 some enumerators are known to have omitted the value of buildings from their statements of total values." Of course, it is possible that the enumerators at the Twelfth Census reported land values too low and omitted the value of buildings as suggested; but there is nothing to show that the enumerators in the Western division were any more at fault in this regard than were the enumerators in other divisions. As to "the inclusion in farms of vast areas of cheap land formerly a part of the public domain," it is to be noted that while this would doubtless lower the average value *per acre*, it would tend to raise the average value *per farm*. This fact strongly suggests that the truth may be the opposite from that asserted by the Census Office, and that the slump in 1900 was due, either to a decline in the land values or to too high valuations in 1890,—or rather somewhat of both. This conclusion is made practically certain by the showing of that report touching the value of implements and machinery. The average value of implements and machinery per acre appears, by Table XIV, p. xxx, of that report, to have fallen, as should be expected from the inclusion of cheap land; but the average value per farm (Table XIII), while showing an increase, shows by far the lowest increase of all the divisions. This, too, is in spite of the further fact, as shown in Vol. 2, p. 17, Table III, that, while in all of the other divisions, excepting only the South Central, the share which the several divisions had in the production of the eight principal cereals *decreased*, the share of the Western division *increased*. It is almost self-evident that the supply of farm machinery must have kept pace with the increase in cereal production; and if the cereal production of the Western division increased, while that of the other divisions decreased, it is almost inconceivable that the supply of farm machinery should have really increased at a lower rate in the Western division than in the other divisions. The inordinately low value of implements and machinery per farm in 1900 can be fully accounted for only on the theory that the values reported in 1890 were too high. It would seem, therefore, pretty safe to infer that, in 1890, all prices were much inflated and that the true line of progress for the Western division would run much more nearly parallel to that of the North Central states.

[1] Department of Agriculture (Division of Statistics) Miscellaneous Bulletin No. 26, p. 15.

into other terms according to the purchasing power of money as determined by Sauerbeck's Index numbers, these figures become, respectively, $10.43, $14.35, and $17.17, a rise during the twenty-year period of approximately 65 per cent. But the average income of the proprietors as determined by dividing the value of all products by the number of farms[1] was $551 in 1879, $538 in 1889, and $822 in 1899. Converting, as before, we have, $551, $620, and $1,003,—a rise of 82 per cent, or an advantage of 17 per cent in favor of the proprietor class. The danger from this concentration of wealth in the hands of a few can hardly be over-estimated. It not only breeds the dissatisfaction that is born of envy, but it places the property-lacking classes also at an economic disadvantage, which, unless overcome by revolution of some sort, must eventually lead to serfdom.

Lest the foregoing data may seem not altogether trustworthy, it will be worth while noting a certain movement taking place within the agricultural population. During the twenty-year period, from 1880 to 1900, the farm-laborer class, in all the states, increased 35 per cent. The farm-proprietor class increased 34.2 per cent. Taking the country as a whole, these classes were evidently keeping a fairly equal pace. But turning to the reports for the seven leading cereal-producing states,—those especially using complex and expensive machinery,—we find the population was distributed as follows:[2]

	1900	1880
Proprietors	1,073,911	836,969
Agricultural laborers . .	631,740	363,233

The farm-proprietor class here increased 28 per cent, but the farm-laborer class increased 74 per cent. In 1880, the laborer class constituted only 30.3 per cent of the total population engaged in agriculture in these seven states; but in 1900, this class constituted 37.1 per cent of that population. The difference, 6.8 per cent, represents a loss of 115,984 persons from the farm-proprietor class and an addition of that number to the farm-laborer class.

The reason for this unequal growth of these two classes of the agricultural population is not deeply hidden. It is the greater advantage that the possessor of a machine has over another who has only his hands. The farm laborers of today, like the workmen in the factories, are being more and more separated from the proprietors whom they serve. These classes understand each other less and tend more and more to become as lords and proletariat. The larger farms, moreover, are passing out of the hands of resident owners and, like factories, are being run by managers whose primary duty is to return profits. So far has this movement advanced already that the United States Agricultural Yearbook for 1905, p. 531, notes the advent of a new class "of landlords who have become such as a consequence of seeking investment and finding it preferably in farm lands."

The more intelligent of the farm laborers, those who must be depended upon to operate the machines, fare very well; but the ignorant and unskilled are probably as ill-conditioned now as before the introduction of machinery. The Thirteenth Annual Report of the Department of Labor on "Hand and Machine Labor" presents data showing the daily wages of farm laborers at different dates, both for work now done by machinery and for work still done by hand. An average of the wages in the production of five crops in which machine power is now much used, in time of hand methods and in time of machine methods, yields the following results:

Average Daily Wages.

Crop	Hand	Machine
Barley	$0 56	$2 21
Corn	78	1 53
Hay	86	1 11
Oats	56	1 50
Wheat	57	2 47

An average of averages gives 66 cents for the time of hand methods and $1.76 for the time of machine methods,—an increase of 166 per cent.

Taking, in like manner, five crops in which machine power is still but little used, we get the following:

Average Daily Wages.

Crop	Hand	Machine
Apple trees	$1 56	$1 28
Potatoes	1 00	1 00
Strawberries	1 30	1 38
Sweet-potatoes	76	62
Tomatoes	93	91

An average of averages in this case gives $1.11 and $1.04,—a decrease of 6.3 per cent.[1] The slight increase in the purchasing power of money can hardly offset this decrease in actual money wages.

This decadence, or disintegration of the agricultural population due to the use of machinery is evident even in the proprietor class itself. Omitting the states whose agricultural population is more than 10 per cent colored,[2] as being more affected by other causes than by the use or non-use of machinery, and ranging the proprietor class in the remaining states in order, according to the percentage of change from farm ownership to farm tenancy during the period 1880–1900,[1] we find the two extremes of the table showing as follows:

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[1] Twelfth Census Report, Agriculture Vol. 1, pp. 688, 703.

[2] Twelfth Census Report, Occupations, pp. lxxiii–lxxviii.

[1] Publications American Economic Association, Vol. 5 3d series, pp. 857–859.

[2] Twelfth Census Agriculture, Vol. 1, p. xciii.

	State	Per cent of decrease
(1)	Kansas	18.9
	Nebraska	18.9
	North and South Dakota	11.4
	Iowa	11.1
	Colorado	9.6
	Minnesota	8.1
	Ohio	8.1
	Illinois	7.9
(2)	Connecticut	2.7
	West Virginia	2.6
	Nevada	1.7
	Massachusetts	1.4
	Vermont	1.1
	Maine	0.4
	Rhode Island	0.2
	New Hampshire	Increase 0.6

The group showing the highest percentage of decrease is composed of those states in which large farms and costly machinery are plainly the characteristic feature. It contains, in fact, the seven leading cereal-producing states of the country.

The total number of farms, the number of farms operated by owners, and the percentage of farms operated by owners in each of the above groups, in the order above given, is presented in the table that follows:[2]

Year	Total number of farms	Number of farms operated by owners	Per cent of farms operated by owners	Per cent decrease in twenty years
First group —				
1900 . . .	1,341,428	928,675	69.2	
1880 . . .	1,004,556	788,721	78.5	9.3
Second group —				
1900 . . .	286,946	248,448	86.6	
1880 . . .	271,310	241,513	89.0	2.4

The rate of decline from ownership to tenancy is nearly four times as rapid in the states where much machinery is used as in the states where comparatively little machinery is used. It will be noted also that not only has the class of owners fallen off more rapidly in the first-named group, but that its percentage of owners at the beginning of the period was far below that shown for the other group.

It is the old problem of labor and capital which, unless we are wise enough to order otherwise, will have to be worked out again in agriculture as it has been already worked out, in some degree at any rate, in the other industries,—more especially in that of manufactures.

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[1] Twelfth Census Agriculture, Vol. 1, p. 689.

[2] Twelfth Census Agriculture, Vol. 1, p. 688.

THE MOVEMENT OF POPULATION FROM COUNTRY TO CITY

By *David Kinley*

The rapid growth of cities is not a new fact in history. We find complaints of similar movements as far back as the beginning of the modern régime and even to some extent before it. As early as the fourteenth century there were complaints in France, Germany and England of the difficulty of obtaining farm labor because of rural migration to the cities. Conclusive proof of this migration is found in the fact that the population of the cities increased from year to year faster than the excess of city births over deaths. At every marked step taken in the transition from a purely agricultural life to the modern commercial and industrial condition there has been a flow of population from country to city. The greater the change in the character of industry the more rapid the flow of the people. For this reason, the phenomenon was more marked in the nineteenth century than in previous times, because commercial and industrial progress was then more rapid than in any previous century in the history of the race.

The growth of city population is not confined to one country. The belief is sometimes expressed that, in the United States, the tendency has been greater than elsewhere, and it has been deplored as a sign of relative deterioration that would place us at a disadvantage in the competition for world supremacy. While, in this article, we can not go into details, the facts are that urban growth is as marked in Germany and England as in the United States, if, indeed, it is not more so. London and Berlin keep well in advance of New York and Chicago; Vienna exceeds Philadelphia. Of cities of the second class, the recent census gives the United States only three—St. Louis, Baltimore and Boston. Europe has fifty or more, the names of most of which are familiar even to school children.

A movement so general must find its causes in influences that are not peculiar to one country, nor to any one industry. The disease, if it is one, is not a disease from which the United States alone is suffering.

The facts.

Meaning of rural population.—It is important to give a precise meaning to the term "rural population." It is difficult to distinguish exactly between places that are urban and those that are rural. For census purposes, the line has usually been drawn so as to class as urban all places of 8,000 inhabitants or more, while all in places below that number are called rural. Obviously, however, there are places of less than 8,000 people that have all the characteristics of cities. Moreover, a small city may contain a considerable proportion of rural population. In the Twelfth Census the limit was lowered to places of 4,000.

Growth of city population in the United States.—If we draw the line according to the Eleventh Census, so as to include among the city population all places of 8,000 inhabitants or more, the following table will show in condensed form the total population of the country, the urban population in the sense adopted, and the percentage which city population is of the whole population of the country:

Census years	Total population	Urban population	Per cent of urban of total population
1790 . . .	3,929,214	131,472	3.4
1800 . . .	5,308,483	210,873	4.0
1810 . . .	7,239,881	356,920	4.9
1820 . . .	9,638,453	475,135	4.9
1830 . . .	12,866,020	864,509	6.7
1840 . . .	17,069,453	1,453,994	8.5
1850 . . .	23,191,876	2,897,586	12.5
1860 . . .	31,443,321	5,072,256	16.1
1870 . . .	38,558,371	8,071,875	20.9
1880 . . .	50,155,783	11,318,547	22.6
1890 . . .	62,622,250	18,272,503	29.2
1900 . . .	75,477,467	24,992,199	33.1

These figures show that the percentage of urban population has steadily increased and that of rural population steadily decreased, throughout the country's history, although at a somewhat irregular rate. Down to 1830, the rate of increase in city population was substantially the same as that of the country at large, and there is no evidence of any large influx of people from country to city. During this period the country was almost purely agricultural, the exceptions being only the few important cities of the Atlantic seaboard. The change began about 1830, when our manufacturing industries began to make more rapid progress, and was accentuated through the succeeding decades, as these industries grew more rapidly. The proportion of people living in cities of 8,000 and more in 1900 was, therefore, nearly one-third of the total population of the country; but the rate of increase during the decade of 1890 to 1900 was considerably lower than that of the preceding decade.

As has been stated, the arbitrary division of the population as between places under and above 8,000 is likely to be misleading. Accordingly, an effort was made in 1900 to lower the limit of population so as to include in the city class, all places of 4,000 people or more, on the supposition that the results would conform more exactly to the real conditions. On this basis, 25.8 per cent of the people of the United States lived in cities in 1880, 32.9 per cent in 1890, and 37.3 per cent in 1900, as against 22.6 per cent, 29.2 per cent, and 33.1 per cent, respectively, on the 8,000 basis. The following table gives the percentage of population in cities, for the states and territories, in 1900, on the basis of 4,000 or more persons constituting urban conditions:

Rhode Island	91.6
Massachusetts	86.9
New York	71.2
New Jersey	67.5
Connecticut	65.5
Pennsylvania	51.1
Illinois	51.0
California	48.9
Maryland	48.2
New Hampshire	46.7
Ohio	44.8
Delaware	41.4
Colorado	41.2
Michigan	37.2
Washington	36.4
Maine	36.2
Missouri	34.9
Wisconsin	34.5
Minnesota	31.0
Indiana	30.6
Utah	29.4
Montana	28.8
Wyoming	28.8
Oregon	27.6
Hawaii	25.5
Louisiana	25.1
Vermont	21.0
Nebraska	20.8
Iowa	20.5
Kentucky	19.7
Kansas	19.2
Florida	16.5
Virginia	16.5
Texas	14.9
Tennessee	14.1
Georgia	13.9
South Carolina	11.7
West Virginia	11.6
Arizona	10.6
Nevada	10.6
Alabama	10.0
North Carolina	8.0
South Dakota	7.2
Arkansas	6.9
Idaho	6.2
New Mexico	6.1
North Dakota	5.4
Mississippi	5.3
Oklahoma	5.0
Indian Territory	2.5

Since the federal census of 1900 was taken, thirteen states have enumerated their population and furnished later figures for part of the country. From these it appears that the percentage of the total population of cities having 8,000 or more inhabitants increased in these thirteen states, by 2.8. The percentage of people in such places in these thirteen states was 47.2 in 1900 and 50 in 1905. The largest increase in percentage, 4.8, was in Kansas. The next largest was in Minnesota, the next was in Iowa, and the next was in New York. The percentage of city population in Wyoming decreased 10.7 in five years. Generally speaking, the states with the larger rural populations show more rapid rate of increase of city population than those more industrially advanced. The rate in three agricultural states is larger than in any of the four markedly industrial states, New York, Massachusetts, Rhode Island and New Jersey. The following table gives the figures for all thirteen of these states:

	1905	1900	Increase
Total	50.0	47.2	2.8
Florida	16.5	15.0	1.5
Iowa	20.3	16.8	3.5
Kansas	18.8	14.0	4.8
*Massachusetts . . .	77.7	76.0	1.7
†Michigan	32.4	30.9	1.5
Minnesota	30.4	26.8	3.6
New Jersey	63.3	61.2	2.1
New York	71.7	68.5	3.2
North Dakota	5.1	3.0	2.1
Rhode Island	83.7	81.3	2.4
South Dakota	4.5	2.6	1.9
Wisconsin	31.5	30.7	0.8
Wyoming	13.4	24.1	‡10.7

*Includes towns. †Census of 1904. ‡Decrease.

The census authorities have added to the figures relating to the states above mentioned estimates of the changes in city and country population for those states which have not taken a census since 1900. The figures are as of the date of June 1, 1905. It appears from them that while the cities are still rapidly growing, their rate of growth is decreasing; for, whereas the percentage of increase from 1890 to 1900 was 32.2, that for the period 1900 to 1906 is 15.9, or a little less than one-half of that of the preceding decade.

In the states mentioned in the last table, there was an increase of population of 12.5 per cent between June 1, 1900, and June 1, 1905, in places between 1,000 and 8,000. The increase in population of places of less than 1,000 in the thirteen states concerned has been 20.6 per cent in the five years. Meantime, the incorporated cities in the thirteen states have increased so that their population in 1905 was 63.2 per cent of their total population as against 59.9 in 1900. This is an increase of 3.3 in the percentage, as against an increase of 2.7 for places of 1,000 and over, showing that the rate of increase in all cities of the thirteen states is not much greater than the rate of increase for the smaller places.

Another point of view of the comparative rates of growth of country and city is obtained by drawing the line at places of 2,500 or more people, and calling all below that country districts. On this basis, we find that cities having at least 2,500 inhabitants contained 29.3 per cent of our whole population in 1880, 35.8 in 1890 and 40.2 in 1900. For the same dates, the percentage of the population in country districts of places of less than 2,500 people were 70.7, 64.2 and 59.8. It is noticeable, however, that the rate of growth of the country districts has remained substantially the same, the percentage of increase for the first of the two decades being 12.9 and for the second 12.4, while the rate of growth of the cities thus classified, has declined, having been 53.8 in the first of the two decades and 25.6 per cent in the second.

The change in the rate of growth of the population of the cities, as compared with that of country population, seems to have a periodical movement, while that of the rural districts is more uniform. The following table taken from Bulletin No. 4 (1903), of the census, brings out this fact very clearly:

Decade	Per cent of increase of population		Ratio of per-cent of increase in cities to that in country districts
	Of cities	Of country districts	
1890 to 1900 . .	37.0	14.1	2.6
1880 to 1890 . .	60.2	11.5	4.2
1870 to 1880 . .	41.1	27.2	1.5
1860 to 1870 . .	59.1	15.6	3.8
1850 to 1860 . .	75.1	29.9	2.5
1840 to 1850 . .	99.3	30.0	3.3
1830 to 1840 . .	68.2	30.1	2.3
1820 to 1830 . .	82.0	31.0	2.6
1810 to 1820 . .	33.1	33.1	1.0
1800 to 1810 . .	69.3	35.0	2.0
1790 to 1800 . .	60.4	34.2	1.8

We see from the table that the rate of growth of city population in this country was at a maximum between 1840 and 1850. It appears too, that the rate of growth of the rural population declined pretty steadily through the century, and is less than half of what it was a hundred years ago.

Displacement shown by occupations.—Another evidence of the relative decline of the country population is found in the statistics of occupations. The census shows that of all males employed in the United States in 1870 and 1900, the percentage of those employed in agriculture fell from 52 to 39.6; that of those in professional services rose from 2.6 to 3.5; in domestic and personal service from 12.2 to 14.7; in trade and transportation from 11.3 to 17.9; in manufactures and mechanic arts from 21.7 to 24.3.

Interpretation of the facts.

Before the figures can be properly interpreted, it is necessary to point out one or two sources of error in them. As has been remarked already, it is difficult to make an accurate distinction between places whose population may be properly called "rural" and those whose population may properly be called "urban." Moreover, even if the figures were accurate they are likely to mislead, because of the change of places from the group below the 8,000 line at one census to the group above the 8,000 line at the next census. That is, in one year some places may be below the arbitrarily selected dividing line, and at the next census above it. In the former case their whole population is counted as rural, in the latter it is counted as urban. Yet the change in population in the meantime may have been only a few hundred.

For example, the census of North Dakota for 1905 shows that the increase in population of places with 8,000 inhabitants and upward over the population of smaller places five years before is 136.1 and in South Dakota 98.1. The great increase in each case arises from the fact that in 1900 each state had but one city of the 8,000 class, whereas in 1905, in each case, a second city had crossed the line into that class. North Dakota in this way more than doubled the city element of her population. Wyoming had two cities in the 8,000 class at the time of the federal census in 1900, but only one in 1905. Therefore, there was a decrease in her urban population of 10.7 per cent. The whole decrease was caused by a falling off of the population of Laramie city from 8,207 at the time of the federal census in 1900, to 7,601 in 1905. The difference is only about 600.

Are these changes to be interpreted as a depletion of the country population, or has the growth of the cities gone on without actually drawing from the country to any great extent? In other words, does the growth of the city population represent a real migration from the country, or is it due to a natural increase of population, with perhaps the addition of immigrants from abroad, so that while their increase represents a relative, it does not represent an actual draft on the rural population?

The sources of city population are four in number: Excess of births over deaths; movement from the country to the city; the influx of immigrants from abroad; and inclusion of suburbs. The last of these sources of increase may be neglected, because they are known in most cases and can therefore be allowed for. Moreover, the rate of growth of cities which have not added to their population by including suburbs is as rapid as that of others. The increase is general.

Modern methods of sanitation have so improvod city life that the birth rate is now considerably in excess of the death rate. There are no statistics on this subject for the whole country; but it is doubtless true that cities now "produce a larger surplus of births than do the country districts." The summary of vital statistics for the New England cities for 1902 shows that the natural increase, due to the excess of births over deaths, of towns of 10,000 and upwards is 8.67 per thousand; whereas in places below 10,000 the rate was only 1.28 per thousand. It is evident from these facts that a large part of the growth in city population under modern conditions is due to the natural increase. This, however, by no means accounts for the tremendous rate of expansion of city population.

A second source of the growth of city population is the tendency of immigrants to locate in the cities. The foreign-born represent about 14.4 per cent of our total population; but, in cities of 25,000 and more inhabitants, 29.18 per cent of the people are of foreign birth, while only a little more than one-tenth of those in our rural districts are so.

However, when all allowance is made for the increase due to excess of city births over city deaths, and to the influx of immigrants, there still remains a considerable part of the growth to be explained by direct draft on the country population. That this is the case is shown by the fact that the cities to which most of our immigrants go are few in number, and that the growth of the cities to which they do not go is as marked as that of those in which they are found.

Causes of cityward movement.

(1) *Superior fertility of American land.*—The causes of the crowding to the city are, of course, numerous and complex. Broadly speaking, however, they may be distinguished as economic and social, or perhaps as general and individual. The first underlying cause is the natural fertility of American land. This fertility has produced a world-wide effect. It has depopulated districts of the Old World as well as of the new. It has produced the abandoned farms of New England, as well as the reduction of the cultivated area of old England. These effects, although in less degree, would have come from the superior fertility of our land, even if it had not been capable of cultivation on a large scale. But large portions of it are of such topographical character as to invite cultivation on a larger scale than the Old World could undertake. This meant a further cheapening of production, for it made possible the large introduction of agricultural machinery, the use of which reduced the cost of production. In short, American land made it possible to feed the world with a proportionally smaller number of workers.

(2) *Use of machinery.*—The thirteenth annual report of the United States Commissioner of Labor, states that the sowing of small grains is accomplished nowadays by machine methods in from one-fifth to one-fourth the time formerly required for hand-sowing. Harvesting under old methods required more than eight times as long as under modern, and threshing from fifteen to thirty times as long, according to conditions. Similar results are shown for other agricultural operations. Of course, these facts mean a large reduction of the number of hands needed for a given crop.

According to Quaintance,[1] the year's crop of barley, corn, cotton, hay, oats, potatoes, rice, rye and wheat, about 1894–1896, required for its production only 21 per cent of the number of days' labor of one man which their product would have required by the methods of about sixty years before.

Machinery may displace labor absolutely, driving out the men, without increasing the crop; or it may enable us to enlarge the crop with a smaller increase of the number of people working than would otherwise be required.

(3) *Changes in the character of farm work.*—Farming, in the days of the self-sufficing farmer who produced for home consumption, was a more inclusive term than now. The farmer not only actually tilled the soil, but to some extent he was obliged to be machinist, carpenter and man of all trades. So multifarious was the work of the farm and so high a degree of intelligence did it require, that an eastern farm has been called the best schoolhouse in the world. The production of machine-made tools and machinery with interchangeable parts has done away with many of the handicrafts the farmer at one time needed to know. These rural industries pursued by a distinctively rural people have become little subdivisions of great factories. Consequently,

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[1] The Influence of Farm Machinery on Production and Labor. Publications of the American Economic Association, third series, Vol. 5, No. 4. [See pages 108–113.]

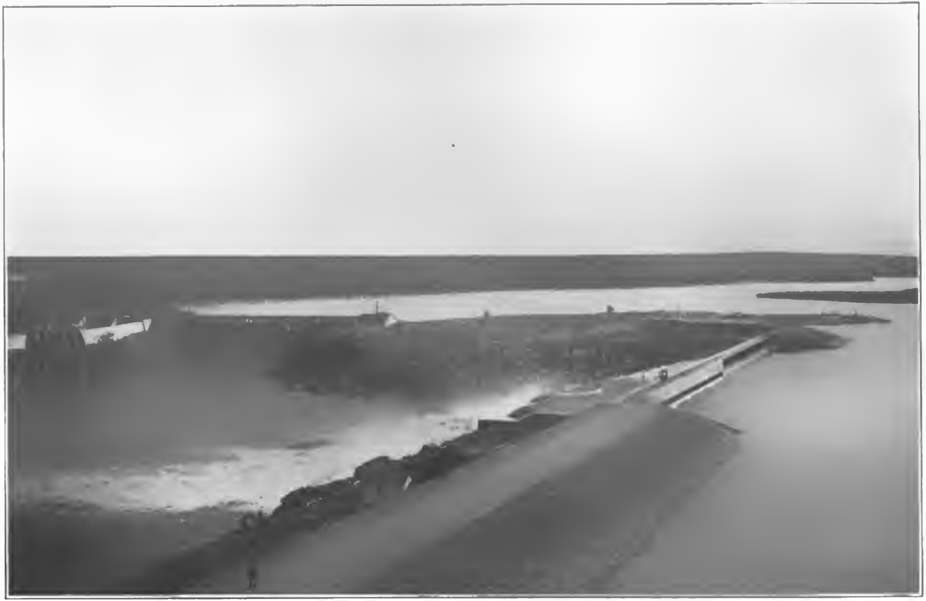

Plate VII. Modern irrigation engineering. Diversion works in the Milner dam, Snake river

in this way, too, fewer hands are needed on the farm. The destruction of domestic industry has thus taken away opportunities to work near home for many young people. Girls formerly employed in this way have sought other work, especially in domestic service, in the cities. Of course, it is correct to say that the disappearance of what may be called the rural handicrafts is a result, as well as a cause, of the decrease in the number of rural people, or rather of its slow increase. The same may be said of all the alleged causes of the relative decrease of the country population.

(4) *Industrial opportunities.*—There are more industrial opportunities in the city than in the country, and, therefore, chances for people of all sorts of talent and character. In other words, it has more kinds of economic activity, better classified, so enabling everybody to find something suited to his ability. For good or ill this is so true that all grades of labor, including that of boys and girls, can be accommodated with work in city industries.

(5) *Irregularity of rural work.*—The irregular demand for labor in the country also has influenced the departure of many people. There is pressure for workers at some seasons, but the need for them falls off in others. Moreover, the hours of work in the country are long and more irregular. Ordinarily, the length of a working day in the city is fixed.

(6) *Railroad tariffs.*—The more or less arbitrary adjustment of freight rates by railroads has also worked to diminish country population in some degree. Rates to competitive points have been lowered, in many instances, without corresponding reductions for non-competitive points. This has put small or rural industries at a disadvantage.

(7) *Centralizing of other business.*—Moreover, the growth of the amount of wealth to be distributed requires a larger number of people to distribute it in proportion to the number of the producers of raw material. Normally, therefore, the development of manufactures requires a larger number of people in trade and transportation.

Again, manufacturing on a large scale must be carried on where the workers are. The same is true of the supply of professional and personal services. It is in the large centers of population that these are needed. Hence, those who supply them congregate in the cities.

(8) *Social causes.*—The lack of opportunity for social prestige in the country has undoubtedly sent many to the city. People with social ambition would go where they would have opportunities to gratify them.

Of great importance has been the educational advantage of the city. In recent years there has been a marked deterioration in the character of the country school, and a marked improvement in that of the city. The desire to secure the advantages of better educational facilities for their children has taken many families to the cities.

Moreover, the comparative scarcity of ready money for personal expenditures has always been a drawback to the country dweller. It has kept his standard of living from being as high and his consumption from being as varied as the expenditure of an equal amount of money would have brought him in the city. To these causes, we must add the lack of means of amusement and the lack of religious advantages, both of which are so abundant in the city. A large portion of humanity loves an exciting environment. These lacks could not be supplied in the country, because of the difficulty of communication. This last has, for many people, made the life of the farm lonesome beyond endurance.

Again, there is no disguising the fact that a great many young men have felt that farming is degrading. Nor has public opinion been helpful in disabusing them of this idea. The country dweller has always been the butt of ridicule. While our school books have taught the dignity of labor, our actions have too commonly belied our belief in it. Ambition has led many young men to the city. It is there that the great prizes in industry and commerce are to be won.

The city offers facilities for a higher standard of living. Water-works, light, sewerage, rapid transit and other advantages too numerous to mention can be had only where a large number of people gather. In the city "has vanished the necessity for drawing water, hewing wood, keeping a cow, churning, laundering clothes, cleaning house, beating carpets and very much of the rest of the onerous duties of housekeeping as our mothers knew it." Finally, the movement cityward is self-stimulating after it has once begun. Inability to get help to carry on farming leads in turn to its abandonment by some people, and their migration to town.

Character of the country exodus.

What kind of people leave or have left the country for the city? It is commonly said that the cream of the country population goes to town. In a measure this is true, but it is not all the truth. It is the energetic or self-reliant, the people with some resources to fall back on, who are likely to venture into the unknown current of city activity. It is the adventurous and enterprising spirit who dares the unknown in small things as in great. It is true, therefore, to a large degree, that the enterprising and industrious people of the rural communities constitute a large proportion of those who constantly drift to the city.

But there is another class, of which the country district on the whole is well rid, while at the same time, the class is benefited by the change. There used to be in country districts families not owning land and depending for their livelihood on work furnished them by the farmer neighbors. This work was irregular. They eked out their income from work in the farming season with wood-chopping and "chores" for their neighbors during the winter, and were always more or less near the verge of non-self-support. The change in farming methods brought about by the use of machinery left large numbers of these without occupation in the country, and they naturally drifted to the cities where they could find work adapted to their talents. The change was an improvement for them and but little loss to the rural districts, excepting in so far as it made labor more difficult to get at irregular intervals.

Results and dangers.

The results of the rural exodus, as it is called, are numerous and far-reaching. The most noticeable, of course, is the abandoned farm, which impresses the onlooker with a sense of loss and desolation. [See page 102.] A second is the stimulation of extensive farming on a large scale and the promotion of one-crop farming.

So far as concerns the population, the best and the worst have, speaking generally, gone from the farm and left what may be called an economic middle class. Not uncommonly the owner of a farm has gone to town and left his farm to be cultivated by tenants. Under these circumstances, the interest of the owner has been against expenditures for the improvement of the country school and the highway, and he has in this way become a promoter of further deterioration. He has himself gone to the nearest town and too often become an obstacle to progress there, too.

The figures show that there is already a check to the movement cityward. The tide of population is advancing westward at a less rapid rate than heretofore. In time, there will be a reflux and the abandoned farm will be taken up again. It will be, however, on a lower standard of living. Farms once abandoned because they did not afford a sufficient living, will not be cultivated again until a change in the standard of living requires more intensive farming.

One of the greatest dangers of the movement is not so much to the country district as to the city itself and to American standards of life. The influx of the foreign-born to our cities is a source of danger. Two-fifths of our foreign-born population are in cities of 100,000 and upwards. In the past, the farm has been the great molder of American manhood, and the great assimilating agency of foreign ideas and elements. Life in the city checks the assimilation of American ideals. Hence, the influences that have kept immigrants off the farm are bad.

Fear is expressed at times that the lessening of the country population means a poorer physique for the nation. Life in contact with nature is doubtless the normal life, and very likely the health of the country inhabitant is, on the average, better than that of the city dweller. It is questionable, however, whether, with modern methods of sanitation and care for health in the cities, the difference is now as great as it once was. Certainly it has not been proven even for those countries which, like Germany, lay stress upon military service, that the country boy is, in the long run, physically better or more efficient in a military way than the city-bred young man.

Fear has been expressed, too, that the influx of a tenant class means ultimately the establishment of a peasant class on our American farms, and the loss of the independent manhood on the farm. There have been some signs of this, but they are few, and as yet, at any rate, there is no reasonable ground for alarm on this point.

Advantages.—Not all the results of the cityward movement, however, are evil. The city has given greater opportunity to many a sturdy and ambitious farm lad, has opened up careers, and has given the world the benefit of talent that would not otherwise have been exercised. "Certainly, the boy thrust out of his early home and the greater world which has received him cordially has suffered no injury, for this country boy has had a great career." Moreover, as has already been pointed out, the scarcity of labor in the country is due, partly, to the departure of that old element of the population which had only irregular employment, and were at the call of the farmer for help. They were like the surplus labor which it is said some corporations now keep on hand to depress the labor market. In going to the city, they have escaped the poverty that inevitably accompanies irregular employment, and have gone where they can be better taken care of if they fall below the line of self-support.

The economic equilibrium.—The true interpretation of the whole population movement is that it is constantly seeking to adjust itself to changing economic requirements. It tends, therefore, ultimately to come into equilibrium with the economic situation. That is to say, the number of people who work on the farm will settle down to the number required to produce the food to feed themselves and the people employed in other ways. In the long run, the rewards which one can find in farming must be such as to induce a sufficient number of people to engage in it.

Remedies.

Some hold the view that it is not necessary to do anything to check the rural exodus or promote a return to the country, because the population will adjust itself to economic opportunity and demand. It is possible, however, that the demand for farm workers may be satisfied and the equilibrium attained, so far as numbers are concerned, but yet on a lower standard of living and poorer ideals of American life. We are bound to prevent such a result, if possible, and therefore, bound to do what we can to promote the welfare of the country population.

First and foremost, we should seek to give on the farm an opportunity for ambition and talent. Fortunately, the conditions are more and more offering this. The management of large farms with complex organization, changing to meet the demand for varied farm products, requires education and talent comparable with that needed in the management of many city business enterprises.

This change in the character of farming which is gradually becoming necessary is being promoted by the excellent means now furnished for the scientific and technical education of the farmer. Successful farming in a large way requires as fine an education and as great ability as are required in any other line of business. The promotion of higher scientific agricultural education is giving a new dignity to the farmer's calling. It is taking it out of the class of work that can be done by any one, and putting it in the class that requires special knowledge and skill. Education is lifting farming from the grade of manual labor to that of a technical calling or a profession.

In the next place, farm life is becoming more attractive because many of the comforts of the city can now be had on the farm. The development of interurban railroads, the rural mail delivery, which should be supplemented with the parcels post, the telephone, better architecture, more commodious houses, traveling libraries and similar educational agencies, all have taken away from the lonesomeness of farm life.

The country school and church should be improved. There is no good reason why with the growing means of communication, a country high school should not be provided for the children of a sufficiently large district to make the school a good one. This does not mean that it should be what is called an agricultural high school in the sense that it should teach the technique of farming. It should teach the love of country life and train for life in the country, but it will fail of its purpose if it becomes a trade school. The combination of country districts for better schools and churches is imperative. Too much emphasis can not be put upon the importance of the country church as a social center, but it should be a church whose ideals and methods should appeal in a broad way to the interests of its constituents and promote their welfare here while seeking their salvation hereafter.

The growing ability to distribute power in electrical form from natural sources can be utilized to build up rural industries of some kinds. These should be industries that afford continuous and not seasonal employment. There is no agency more injurious to the morals of the young country people than an establishment like the canning factory, which brings them to town for intermittent work under conditions as bad in some cases as those obtaining in the sweat shop in the city.

This movement, when once begun, will strengthen itself. As it grows, it will decrease the lonesomeness, and furnish the opportunities for economic success, to obtain which has been the influence that has taken many from rural life.

We need have no fear that, with the promotion of such agencies, the character of the country population will not be maintained. Its number will adjust itself so as to distribute workers between farming and other pursuits according to the economic demand, without much reference to artificial efforts to aid or check the distribution.

Literature.

The most important sources of information are: The United States Census Reports, especially the Twelfth; The report of the Industrial Commission, especially Vols. X, XV, and XIX. See also A. F. Weber, The Growth of Cities; W. L. Anderson, The Country Town; P. A. Graham, The Rural Exodus (for English conditions); W. H. Brewer, The Farm and Farmer, the Basis of National Strength; Josiah Strong, The New Era; American Economic Association, Economic Studies, Vol. II; J. A. Hobson, The Evolution of Modern Capitalism; H. W. Quaintance, The Influence of Farm Machinery on Production and Labor; L. H. Bailey, The Outlook to Nature.

THE CENTER OF AGRICULTURAL PRODUCTION

By *David Kinley*

One of the most striking social events in the life of the people of the United States has been the westward movement of population and agriculture. Almost from the beginning of the occupation of the country by Europeans, settlers began to move into the territory west of the Atlantic seaboard. Yet, so slow was the movement down to the beginning of the nineteenth century that so clear-sighted a statesman as Jefferson expressed the opinion that it would be a thousand years before the people of the country reached the western ocean. The work thus laid out for a thousand years was accomplished in a hundred or less, and both the movement and its rapidity have had a profound effect on the character of our people.

General character of the westward movement.

Broadly speaking, the westward movement of population has been one phase of that long-continued movement in world history known as the "westward migrations." It was a repetition on a new continent of movements which history records in numerous instances of the Old World. It differed, however, in at least one important respect: The migrations of the Old World were those of a people seeking land from which to secure their own food. The movement was that of a group, a clan, a tribe. In the United States, on the contrary, the movement was due to individual initiative, and the motive was the acquisition of wealth, the desire to secure a competence and economic independence.

The bulk of agricultural production would have moved westward with population if the population movement had been slow and agriculture had been pursued merely for the support of the population itself; that is, if the consumption of our agricultural products had developed only *pari passu* with the growth of population, we still would have had a westward movement, because the unoccupied land was in the West. It is important to notice, however, that the westward movement of agriculture distributed, and constantly kept in advance of, the centers of population. The movement was therefore for the purpose of securing profit by supplying the markets, and derives its character and significance not a little from this fact. It was "commercial," not "self-sufficing" farming.

General evidence of the westward tendency.

The westward movement of agricultural production is best shown by the study of the distribution of production of the staple crops, particularly the leading cereals. There are certain farm products that are necessarily raised in greater abundance in proximity to populous centers. Their westward movement, in the main, has kept pace with that of the more densely populated centers. The great staple cereals, however, have outstripped population, because their production has not been dependent upon the consumption of a neighborhood. In short, the extent and rapidity of the westward movement of agriculture is best shown by the movement of the production of the cereals that have been marketed largely abroad.

In the discussion of this matter, the census selects eight cereals that are produced in considerable quantities, as the types. They are barley, buckwheat, corn, kafir, oats, rice, rye and wheat. The trend of production of these cereals is shown in a general way by the fact that of the geographical divisions of the country, as made by the census, the Western and North Central groups of states show an increasing proportion of the production of these crops from decade to decade; and it is shown more clearly by the fact that first rank in the scale of production by states passes in successive decades to more remote Western states.

Table I shows the percentage of the total production of the eight typical cereals selected by the census in each of the geographical divisions from 1850 to 1900:

TABLE I.—PER CENT OF THE TOTAL PRODUCTION OF EIGHT SPECIFIED CEREALS IN EACH OF THE GEOGRAPHIC DIVISIONS, SUMMARY 1850 TO 1900.

Geographic divisions	1900	1890	1880	1870	1860	1850
North Atlantic .	5.2	6.2	8.7	15.3	16.2	19.5
South Atlantic .	4.9	5.2	6.8	9.4	15.2	20.0
North Central . .	73.3	74.8	70.9	58.5	46.5	35.8
South Central . .	13.0	10.8	10.9	14.1	20.8	24.6
Western	3.6	3.0	2.7	2.7	1.3	0.1

It will be seen from the table that, whereas the North Atlantic states produced 19.5 per cent of the cereal crops in question in 1850, they produced only 5.2 per cent of those same cereals in 1900. The share of the South Atlantic states has fallen from 20 to 4.9 per cent in the same time; that of the South Central from 24.6 to 13 per cent in the same time. On the other hand, the share contributed by the North Central states has risen from 35.8 to 73.3 per cent, and that contributed by the Western states from 0.1 per cent to 3.6 per cent.

The figures show in a general way that the bulk of our agricultural production has been moving northwestward for fifty years. A similar conclusion is pointed to by comparing the rank of the different states in the production of the eight cereals under consideration for the same fifty years, as shown in Table II. The states are listed in the order of their rank in production in the last census year:

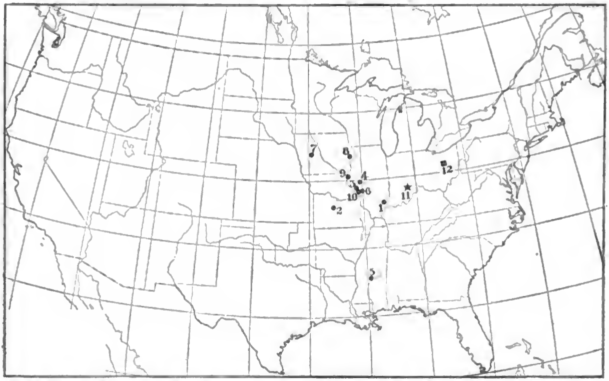

Fig. 43. Map showing the centers of farms, agricultural products, population and manufactures at the Twelfth Census, 1900. 1. Center of number of farms. 2. Center of total area in farms. 3. Center of improved acreage. 4. Center of farm values. 5. Center of cotton-production. 6. Center of corn-production. 7. Center of wheat-production. 8. Center of oats-production. 9. Center of six-cereals production. 10. Center of gross farm income. 11. Center of population. 12. Center of manufactures.

TABLE 11.—PRODUCTION OF CEREALS BY STATES AND TERRITORIES, SUMMARY 1850 TO 1900.

States and territories	Rank					
	1900	1890	1880	1870	1860	1850
Illinois	1	2	1	1	1	2
Iowa	2	1	2	3	10	18
Kansas	3	3	6	16	25	
Nebraska	4	4	12	26	34	
Missouri	5	5	3	4	4	9
Indiana	6	7	5	6	3	5
Ohio	7	6	4	2	2	1
Minnesota	8	8	13	12	24	35
Wisconsin	9	9	8	8	12	20
Texas	10	13	17	18	20	22
Pennsylvania	11	10	7	5	5	6
Michigan	12	12	11	11	16	17
South Dakota	13	19				
Kentucky	14	11	9	9	7	3
North Dakota	15	22	29	42	40	
Tennessee	16	14	14	10	9	7
New York	17	15	10	7	6	4
California	18	16	15	14	23	36
Oklahoma	19	48				
Arkansas	20	18	21	23	19	21
Virginia	21	17	16	13	8	8
North Carolina	22	21	18	15	11	11
Mississippi	23	24	23	21	15	13
Georgia	24	20	19	17	13	10
Alabama	25	23	20	20	14	12
Indian Territory	26					
Maryland	27	25	22	19	17	15
Washington	28	31	33	40	38	
Louisiana	29	29	28	27	22	19
Oregon	30	28	27	30	33	32
West Virginia	31	26	24	24		
South Carolina	32	27	26	25	18	14
New Jersey	33	30	25	22	21	16
Colorado	34	32	38	37		
Idaho	35	41	42	44		
Montana	36	39	41	43		
Delaware	37	34	31	31	28	25
Vermont	38	33	30	28	26	23
Florida	39	36	34	35	32	29
Utah	40	37	39	38	37	33
Maine	41	35	32	29	27	24
Connecticut	42	38	35	32	29	27
Massachusetts	43	42	36	34	30	26
New Hampshire	44	40	37	33	31	28
New Mexico	45	43	40	36	35	31
Wyoming	46	44	47	47		
Arizona	47	45	45	45		
Nevada	48	46	43	39	41	
Hawaii	49					
Rhode Island	50	47	44	41	36	30
District of Columbia	51	49	46	46	39	34

It appears that, in 1850, Ohio led the rest of the states of the country in the amount of its cereal products, but fell to second place in 1860, and reached seventh place in 1900. Illinois, which was second in 1850, took first place in the three succeeding decades, fell to second in 1890, and took first again in 1900. Iowa rose from eighteenth place in 1850 to first in 1890, and second in 1900; Minnesota from thirty-fifth to eighth in the same time, Wisconsin from twentieth to ninth; while between 1860 and 1900, Kansas rose from twenty-fifth place to third, and Nebraska from thirty-fourth to fourth. These figures show that the western and northwestern states have been gradually taking the leading places in the production of the cereals. The six states, Illinois, Iowa, Kansas, Nebraska, Missouri and Indiana, produced in the last census year, 1899, 51.7 per cent of the cereals reported to the census, whereas in 1849 they had contributed only 22.9 per cent.

Movement of the center of production.

The facts concerning the westward movement of agricultural production are best brought out, however, by a study of what is called the center of production. By center of production is meant the center of gravity of production. If we regard the whole territory of the country as a flat plaque, with the product of every acre represented by a weight hanging from the center of the acre, then that point of the plaque on which, if supported, the plaque would be at rest, would be the center of gravity of the whole system, or the center of production.

Of course, this is somewhat difficult to calculate, although theoretically the problem is simple enough. The difficulties arise principally from the inaccuracy of the data. Doubtless, the figures of crop-production reported are not exact. Probably, there are many omissions of small amounts. A second source of error is due to the fact that the census figures relate to the crop of the year preceding the inquiry and in many cases must be given from memory. In the third place, the census figures give the production of single years. Now, the census year may be a bumper or a lean year; according as it is one or the other will the figures give us a different result, and the center of production calculated will vary. It would be better if we would get the average production for a series of, say, five or ten years as a basis of our calculation. However, this is not possible, and the figures, such as they are, probably do not lead us very far astray.

As already noted, the census selects eight cereals for the purpose of discussing the westward movement of the center of production. The three principal cereals, corn, wheat and oats, preponderate so heavily in the total, however, that a consideration of these three alone is sufficient for our purposes. In the census year, corn occupied 51.3 per cent of the total acreage of the eight cereals in question (184,994,588 acres); it afforded 60.1 of the total yield of these eight cereals (4,434,698,746 bushels); and its value was 55.8 per cent of the whole, or $484,231,038. The wheat had 28.4 per cent of the acreage, 14.8 per cent of the yield and 24.9 per cent of the value. Oats had 16 per cent of the acreage, 21.3 per cent of the yield and 14.6 per cent of the value. The three together had 95.7 per cent of the acreage of the whole eight cereals, 96.2 per cent of the total yield and 95.3 per cent of the total value. These three cereals, in a sense, feed the world, and may be taken as the nucleus for our study of the movement under consideration.

Corn.—If, now, we look at the production of corn for a series of years we find that the proportion contributed by the North Central group of states has risen from 37.5 per cent of the whole in 1850 to 72.8 per cent in 1900. The proportion contributed by the Western group of states, according to the census classification, has remained pretty steady for the half century, while the contribution of all other sections has declined. The center of production of corn, therefore, has tended to settle somewhere in the North Central group of states. The following table shows the center of corn-production for the fifty years:

TABLE III.—POSITION OF THE CENTER OF CORN-PRODUCTION, 1850 TO 1900.

Census year	North latitude	West longitude	Approximate location by important towns
1900 . . .	39° 19′ 33″	90° 27′ 6″	54 miles southwest of Springfield, Ill.
1890 . . .	39° 16′ 57″	90° 26′ 49″	55 miles southwest of Springfield, Ill.
1880 . . .	39° 28′ 12″	89° 7′ 43″	36 miles southeast of Springfield, Ill.
1870 . . .	38° 47′ 13″	87° 14′ 15″	90 miles southwest of Indianapolis, Ind.
1860 . . .	38° 1′ 54″	86° 29′ 4″	47 miles west-southwest of New Aibany, Ind.
1850 . . .	39° 14′ 54″	81° 43′ 38″	86 miles east-southeast of Columbus, Ohio

It appears from the table that the center of corn-production in 1850 was about 86 miles east-southeast of Columbus, Ohio, at latitude 39° 14′ 54″, longitude 81° 43′ 38″. In the last census year, 1899, the center was 480 miles further west and about 5 miles further north, at a point about 54 miles southwest of Springfield, Ill., at north latitude 39° 19′ 33″, west longitude 90° 27′ 6″. The greatest westward movement was in the decade from 1850 to 1860, and recently the rate of movement has been slower.

Wheat.—Turning to the statistics for wheat, we find that the contribution of the north central group has risen from 43.6 per cent in 1850 to 67 per cent in 1900; that of the Western states has increased from 0.6 in 1850 to 13.7 per cent in 1900. Those in the North and South Atlantic groups have fallen off heavily, while the share of the South Central group has increased. As the census report of 1900 remarks: "In 1850 New York was one of the great wheat-producing states, and the Genesee valley was the most important wheat center of the country. In a half century the wheat-production of New York has decreased over three million bushels, and its proportion of the total crop has declined from 13.1 per cent to 1.6 per cent, while the four states which now stand at the head of the list were, with the exception of Ohio, unsettled." The table at the bottom of the page shows the center of wheat-production for the time in question.

TABLE IV.—POSITION OF THE CENTER OF WHEAT-PRODUCTION, 1850 TO 1900.

Census year	North latitude	West longitude	Approximate location by important towns
1900 . . .	41° 39′ 19″	94° 59′ 23″	70 miles west of Des Moines, Iowa
1890 . . .	39° 33′ 53″	93° 9′ 18″	138 miles south by east of Des Moines, Iowa, (in Missouri)
1880 . . .	40° 36′ 14″	90° 30′ 46″	69 miles northwest of Springfield, Ill.
1870 . . .	40° 39′ 17″	88° 48′ 40″	82 miles northeast of Springfield, Ill.
1860 . . .	39° 59′ 59″	86° 1′ 38″	18 miles north by east of Indianapolis, Ind.
1850 . . .	40° 14′ 18″	81° 58′ 49″	57 miles east-northeast of Columbus, Ohio

It appears from the table that in 1850 the center was about 57 miles northeast of Columbus, Ohio, in 40° 14′ 18″ north latitude and 81° 58′ 49″ west longitude. In the following fifty years it moved 99 miles north and 680 miles west, to a point 70 miles west of Des Moines, Iowa, in 41° 39′ 19″ north latitude and 94° 59′ 23″ west longitude.

A large part of the northward movement took place in the years between 1890 and 1900 on account of the development of the wheat fields of Minnesota, the Dakotas, and states farther west.

Oats.—Oats shows the same general trend. The contribution of the South Central states increases from 28.9 per cent of the whole in 1850 to 81 per cent in 1900, and that of every other division, excepting the Western states, fell off heavily. The percentage of those states increased by about three, as shown in the following table:

TABLE V.—POSITION OF THE CENTER OF OAT-PRODUCTION, 1850 TO 1900.

Census year	North latitude	West longitude	Approximate location by important towns
1900 . . .	41° 39′ 15″	91° 8′ 11″	58 miles north of Burlington, Iowa
1890 . . .	41° 10′ 43″	89° 46′ 52″	39 miles north-northwest of Peoria, Ill.
1880 . . .	41° 2′ 43″	87° 13′ 37″	62 miles south-southeast of Chicago, Ill. (in Indiana)
1870 . . .	40° 59′ 13″	85° 42′ 46″	30 miles west by south of Fort Wayne, Ind.
1860 . . .	41° 0′ 38″	81° 2′ 5″	48 miles southeast of Cleveland, Ohio
1850 . . .	39° 43′ 22″	81° 35′ 29″	80 miles east by south of Columbus, Ohio

It will be seen that since 1850 the center has moved from a point 80 miles east by south of Columbus, Ohio, 39° 43′ 22″ north latitude, 81° 35′ 29″ west longitude, 575 miles west and 120 miles north to a point about 60 miles north of Burlington, Iowa,—41° 39′ 15″ north latitude, 91° 8′ 11″ west longitude, in general, a northeasterly direction.

Causes of the westward movement.

The economic opportunity.—A process so unusual, so marked, so persistent and extended can not but have a significant relationship with the social and economic motives and ideals of the people, however unconscious of it they may be.

Professor Frederick J. Turner, in his masterly study of "The Significance of the Frontier in American History," has proven the profound influence exerted by frontier life in the molding of American character and ideals. The continuity of this frontier life—the social "crucible," as Professor Turner puts it, in which individual and racial differences were fused—was made possible by the continuance of the westward movement of our agricultural production.

The most fundamental and far-reaching explanation of the facts we are discussing is to be found, of course, in economic motives. The vast area of unoccupied land attracted settlers by appealing to their self-interest. Here was an unequaled opportunity for every man of vigor and self-reliance to go out and win a fortune for himself and become a property holder.

The first cause, therefore, may be set down as the great extent of land to be had merely for the taking. Men would take up unoccupied land and cultivate it as far away from the markets as was profitable. As population moved westward, of course, it was possible to push the line of cultivation farther west.

Moreover, the westward movement gradually built up, in many cases, centers of population far removed from the old ones, which themselves served in large measure as markets for products of the newly developed country. This, however, is too general a description of the situation, and we can describe some of the important causes which stimulated it or gave effect to the motive of self-interest more specifically.

The land policy of the Government.—The national policy of rapid settlement, of promotion of immigration, and of the upbuilding of home industries, all strengthened the westward movement of agriculture. From the beginning, it has been the policy of the federal government to induce settlement of western lands. Consequently, land has been given away or sold at a nominal price to *bona fide* settlers, and donated to corporations, particularly to railroad companies, with a view to promoting a rapid settlement. With land at one or two dollars an acre, people seeking a new home could afford to go and break in the wilderness, even if for some time they did not have a market for a large surplus product, but were able only to make a good living.

Land grants to railroads.—The land grants to transportation companies had a double effect on the movement we are discussing. In the first place, they made it possible for settlers to go farther away from the settled areas; and, in the second place, they cheapened the cost of transportation so that the product of more distant fields could be taken at a profit to the older markets. The profitable cultivation of western farms was closely bound up with cheap transportation. In the early decades of the nineteenth century, "the bulk of the crop, as compared with its value, practically prevented transportation by land farther than a hundred miles." From seven to ten dollars a hundred-weight was the freight charged between Pittsburg and Philadelphia about 1817, and several thousand wagons were employed in transporting merchandise between the two places. It cost about one bushel of wheat to pay the expense of marketing two at a seaport town. These facts explain the ardor of the farmers in the West for the internal improvement policy of the federal government.

By 1820, freight rates had been considerably reduced by the construction of the national road and by the development of steamboat traffic on the Mississippi. Nevertheless, the cost of carrying produce to market was still too great. This high cost compelled the farmers of the West to turn their attention to live-stock and whisky, both of which turned the crops into products of high value and small bulk. It was not, therefore, until the time of railroad building that transportation facilities began to be at all adequate.

A great deal of the railroad construction of the West was pioneer in the sense that it was done at a time when and in places where it could not be conducted on a paying basis, but was aimed at the "development of the country." By reducing the cost of carriage of wheat, for example, the railroads made it profitable to cultivate a piece of land the native fertility of which enabled it to compete with a less fertile piece of land lying close to the market. Under such circumstances the less fertile piece of land close to the market went out of cultivation, and we had the phenomenon of "abandoned farms," about which so much has been heard. The cheaper the transportation and the cheaper the cost of production on the lands farther west, the greater the demand that could be met by the western supply, the lower fell the margin of cultivation in the East and England (that is, abandoned farms increased), and the farther westward moved the center of agricultural production.

"The rise of an agricultural surplus was transforming the West and preparing a new influence in the nation. It was this surplus and the demand for markets that developed the cities. . . . As they grew, the price of land in their neighborhood increased; roads radiated into the surrounding country; and farmers, whose crops had been almost worthless from the lack of transportation facilities, now found it possible to market their surplus at a small profit."[1]

The railroads worked in yet another way to push the bulk of our agricultural production westward, especially that of the cereals. Cheapened transportation stimulated resort to crops that were most easily raised and marketed. The three principal cereals, corn, oats, wheat, and especially wheat, met these conditions. Their cultivation was cheap and easy and they could stand long transportation. Hence, the farmer who found it necessary to get a crop that would yield immediate returns—and this was the case with most of the frontier farmers—turned to the cereal crops as those most likely to yield a large profit.

Still another influence arose out of the development of transportation, to drive agricultural production westward. The building of the railroads, by stimulating migration, raised the price of the adjacent land. This usually made the land too expensive for wheat-production in competition with the cheaper land farther west. The higher-priced land had, of course, to pay interest on the investment and also rising rent. If devoted to wheat-culture, it must pay, as wheat land, as high a rent as the most profitable crop that could be raised on it would afford. The per bushel or per acre expense of producing wheat under these circumstances sent the producers to cheaper land.

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[1] F. J. Turner, The Rise of the New West, p. 98.

Influence of protection.—The national policy of promoting home industry also doubtless had considerable influence in stimulating the westward movement of agriculture. The "home" market argument is one that has always appealed strongly to our farmers. It is doubtless true that our farming would have increased rapidly if we had not stimulated home manufactures. Even if we had been content simply to supply raw materials and food to Europe, the supply needed through the nineteenth century would have been large and constantly increasing. The policy of promoting home industries, however, stimulated the growth of population, creating large centers in the eastern part of our country, and thus added to the demand for agricultural products. Our farmers were then called on to supply both the home and foreign markets. There is no doubt that Hamilton and his successors were right in urging that the promotion of home industries was a means of enlarging our population and indirectly of stimulating our agriculture. Hence, manufactures grew in the East, and the center of agricultural supplies necessary for their support moved constantly westward.

The Civil war.—The influence of the Civil war in pushing the center of agriculture westward must not be overlooked. During the years of the war it threw out of cultivation a considerable portion of land on which crops had previously been raised, and the unsettled economic conditions for years after the war interfered with the entire resumption of agriculture on this area. Moreover, the work of furnishing the necessary supply had been transferred, in the meantime, to other states farther west and north. They, therefore, in a measure, held the market. That these statements are particularly true of corn, is shown by the fact that between 1860 and 1880 the center of production moved considerably northward, particularly in the second decade of the period.

Bonanza farming.—The physical character of the prairie land was conducive to large-scale and inexpensive methods of production. What the farmer is interested in is net profit, not total profit. If by "scratching the soil," and a great deal of it, he can get a crop that will yield him a large surplus over his cost, even though the per acre product is small, it is to his advantage to do so. The conditions of American agriculture hitherto have been favorable to this method of production, and herein we find the basal explanation of the fact that has been so complained of, that American methods of farming are wasteful and afford a smaller per acre result than could be obtained by better methods of cultivation. The point is that the better, or the more expensive, or more intensive, method of cultivation would not "pay."

It was necessary, therefore, to reduce the expenses of producing the cereals as much as possible. Production on a large scale would do this. The prairie land facilitated production on a large scale, provided a sufficient amount of labor could be obtained. In the absence of this, machinery was invented, especially during, and immediately after the Civil war, and this, in turn, made possible a still larger scale of production.

Lack of capital.—Lack of capital to carry on intensive farming also contributed to drive many farmers to new western farms, as better transportation and increasing population raised the value of the old land. It is probable that in many cases the older farm holdings would have been as profitable to the farmer, if he had had the capital to cultivate them intensively, and thus increase his crop, as were the newer and more easily worked farm lands farther west. Indeed, there are instances now in which the abandoned farms of New England, under intensive cultivation, with relatively large capital are being cultivated very profitably. But the early farmer did not have a large capital; or, if he did, it was to his advantage to acquire a large farm that would yield him a given profit under extensive cultivation, rather than to put his capital into a farm of a smaller area yielding the same net profit on his investment. For the increase in value of the large farm would in time enable him to sell off part of it and still cultivate the remainder, if he wished, at the same net profit, so that the "unearned" value of the land sold off would be clear gain to him.

Soil exhaustion.—The extensive method of cultivation, the one-crop system, and the wastefulness of it, tended to exhaust the soil very rapidly. After a decade or two the "old farm" began to yield less, and it was to the interest of the owner to leave it and push westward. Of course, soil exhaustion was only relative. It is true that by staying on the old land and cultivating it more carefully and more "intensively" it could have been kept in use indefinitely, yielding a larger and larger product. Even today, we find representatives of the Department of Agriculture telling the American farmer that he should be raising forty, fifty or sixty bushels of wheat to the acre instead of twenty or thirty. The scientific possibility of this is unquestionable. What the scientific advocate forgets is that it would not now, any more than in the past, be economically profitable. Profit was found by pushing constantly westward to the unbroken soil.

Minor causes.—The building of factories may have caused, in some cases, the abandonment of farms in old neighborhoods, making it necessary to get their supply of farm products from farther west. A good many observers have noticed the demoralizing effect of factory life and wages on a farm community. Farm hands and even owners have been attracted by what seemed the easier hours and more certain and better wages in industries. Undoubtedly, too, the migratory spirit of our people has been a contributing factor in our western movement; but this spirit of restlessness, after all, is not confined to the "native American." It has been aroused among peoples of all races who have come to us by the possibility of bettering their condition. It is, therefore, a secondary rather than a primary cause of the movement we are considering. The migratory spirit itself is due to the possibility of economic improvement.

Results.

The first and most obvious result of the westward movement of agriculture is that practically all the cultivable land of the country has been brought under the plow. Some has passed through cultivation and is lying now untilled. The influence of the increasing production of our western land has reacted for a generation or more on English farming and has reduced its acreage in those crops that could be cultivated on a large scale on our western prairies. The same has been true of New England. And, indeed, we find these abandoned farms, or "land below the margin of cultivation," as far west as the Ohio, and probably, in a few cases, the Mississippi river; they are the least adaptable and least profitable farms.

The rate of movement, of course, has been checked, and very likely there will be in the future a recession of the movement eastward. As the supply of agricultural products needed becomes greater resort must be had to more intensive cultivation, because the unoccupied land is exhausted. The occupancy of new land is checked by its physical limitations. It is all occupied. If we are to get more out of the soil of our country we must adopt more expensive methods of production. This necessity will make it possible for once-abandoned land to be brought under the plow again. And we may look in the next fifty years for an increasing proportion of the important crops to be supplied by the more eastern states, as was the case a generation ago.

The rapid westward movement of agriculture has resulted in starting industrial activity of some sort over the whole country. If Jefferson's opinion that the western country would not all be occupied for a thousand years had proved true there would still be a vast extent of our country unworked. We have hastened the exploitation of our natural resources. We have, so to speak, skimmed the cream of our agricultural and industrial opportunities. We are now face to face with the problem of a more difficult, that is, of a more expensive, system of production in all lines; or with the necessity of continual improvement in the arts of production to offset the growing cost due to the necessity of resorting to more intensive methods; and we find it necessary to replace, in some way, some of the natural resources that we have wasted because of their very abundance.

Some of the eastern states in which "abandoned farms" have become numerous have made an effort to have them reoccupied, especially by farmers from European countries. This is a short-sighted policy, and is simply another phase of the stimulation of the exploitation of our resources. These farms were abandoned because, on the American standard of living, the farmer could make more elsewhere. The person who occupies them must either be content with a smaller return than the American farmer is getting elsewhere, or he must show himself a more skilful farmer, or new methods and appliances and kinds of farming must be found. It is doubtless true, as has been said, that a considerable portion of this land can now be used to advantage in raising crops of a more perishable nature than the grains, the market for which is closer at hand, and whose cultivation must be "intensive." It is hardly to be expected, however, that an imported farmer will be quicker to see the likelihood of pecuniary advantage, or to find or adopt new methods of cultivation, more quickly or successfully than a native American. In a considerable number of instances, therefore, these abandoned farms can be reoccupied only by those who are content with a lower standard of living. The stimulation of the process of reoccupation, therefore, is simply forcing a lower standard of living upon part of the country before it is necessary to its normal development.

The lower standard of living will come soon enough, always barring, of course, progress in the arts, from the natural growth of population and the necessity of returning to cultivation upon what the economists call a lower margin. Much is to be hoped, of course, from the wide extension of scientific agricultural education. Too much credit cannot be given to our agricultural experiment stations, and, of recent years, to the Department of Agriculture at Washington, for the help they have given in preventing soil exhaustion and renewing the soil after it has been exhausted. There is no reason to think that progress in the arts will cease, yet such periods have occurred in history, and it is not unthinkable that even the United States may reach a period when no substantial progress in agricultural methods will take place for a considerable time. If so, we must either lower our standards of living or stop the increase of population. [See discussion of abandoned farms by Fowler, page 102.]

Literature.

Census of 1900, Vol. VI, No. 2; Report of the Industrial Commission, 1901, Vol. X, pp. lxxxiv, cxlvi, and elsewhere; C. W. Thompson, Q. J. E., 18:570, The Movement of Wheat Growing; F. W. Turner, Significance of the Frontier in American History, Proceedings American Historical Association, 1893; F. S. Earle, Development of the Trucking Interests, Yearbook, Department of Agriculture, 1900, pp. 437ff.; G. K. Holmes, Progress of Agriculture in the United States, Yearbook Department of Agriculture, 1899, pp. 37ff.; T. J. Donaldson, The Public Domain, Washington, 1886; F. J. Turner, The Rise of the New West. Current periodical literature contains articles on various phases of the subject.

CHAPTER IV

THE NATURAL RESOURCES OF AGRICULTURE

DIRECT DEPENDENCE ON THE RESOURCES OF THE EARTH is the characteristic of agriculture. The degree to which these natural supplies are husbanded and utilized measures the efficiency of agriculture at any epoch. Various institutions arise in the effort to use these resources, and these institutions become the most effective organizations in which land-workers partake. In this chapter we shall mention some of the native resources with which the farmer is most directly concerned, and discuss them in relation to the welfare of society.

The natural material sources of agriculture are the surface of the earth and the atmosphere. The land produces. Its products are plants and animals. The farmer must cause the land to produce more abundantly and he must protect and save it for his children. He must use the plants and animals that come out of it. We have discussed the plant resources in Vol. II and the animal resources in Vol. III. It is surprising what a very small percentage of the kinds of plants and animals man has brought to his use; and yet we must remember that the domestication has been largely fortuitous, for it is only about two centuries ago that men became possessed of the desire to know and name all the things on the earth. As human population increases and the wants of men expand, it would seem that much greater levy must be made on the plant and animal occupants of the earth: of this, however, we are not at this place concerned.

When it comes to the land, or the surface of the earth, we find two classes of efforts to be made by the husbandman,—to improve the land that he occupies, to reclaim land that is not now cultivable. The former category we have considered directly in Vol. I. The farmer must drain, irrigate, till, enrich his land. We have a fairly adequate appreciation of the importance of tilling and fertilizing, but we have not yet arrived at a rational realization of the importance, on the individual farm, of drainage and irrigation: the nice control of the water-supply will in the future increasingly determine the performance of land. Drainage and irrigation are not alone reclamation processes: they are essential to any exact handling of land anywhere.

Reclamation by adding and saving water.

The reclamation of lands not now cultivable has received much attention in regions requiring recovery by irrigation; but there are other regions requiring other means, and these regions we have not sufficiently considered. One of these means is "dry farming," now much in the public mind. (Cf. Vol. I.) Vast areas of the earth's surface beyond the reach of irrigation may be utilized by this means. In fact, the ideas involved in "dry farming" must be applied in nearly all regions, and increasingly so as the planet becomes drier.

We must develop a new attitude towards rainfall. The hill lands in humid regions often suffer much from drought because the rain is shed from the land as from a roof. The surface soil may be continually washed away, so that the farmer is constantly tilling a subsoil. In many practically flat areas the destruction by erosion is also great. How to retain the rainfall for the benefit of the land and to prevent erosion is a question of modes of tillage and of skillful handling of the crop cover.

Reclamation by removing water.

We are now coming to an appreciation of the necessity of reclaiming swamp lands. Some of them must be dyked and some of them only drained. Vast areas of these lands lie near some of the greatest centers of population. In fact, since great cities are usually on seashores or wide water-ways, it is the rule rather than the exception that extensive swamps are near them. Much of the fringe of the

Atlantic coastal plain is waiting reclamation. Vast marshes border parts of the Mississippi river. A shaded contour map of any state will impress the observer with the great extent of lands that may be brought into profitable use by the removal of water. Much has already been accomplished by such reclamation, as, for example, in the Dismal Swamp region of Virginia and North Carolina, the Kissimmee region of Florida, the Kankakee marshes of Indiana and Illinois, the tula lands of the Sacramento.

Drainage-reclamation will be increasingly urged also in the interest of public health. The old idea of miasma has been translated into mosquito. It is a question of who or what shall dominate the earth.

We may expect to see institutions developed about the idea of drainage-reclamation as we have about that of irrigation-reclamation. The low lands will make their impression on the characteristics of the people in certain great regions of the new world, even as they have in Holland and elsewhere.

The forest crop.

Great regions of Canada and the United States must be held in forests and other regions must be reclaimed to forests. We shall soon come to realize forests as crops under the control of man. Forests may be crops of individual ownership, but to an increasing extent they must belong to society. The following quotation ("The State and the Farmer") suggests the touch of this subject with the so-called abandoned farm question: "It is to the forest crop that vast areas of the roughest, highest and most unproductive lands are best adapted. As a people, we must re-orient ourselves to the subject of forests. The forest is, or ought to be, considered as a crop. Natural forests are not necessarily the best forests, so far as the production of timber is concerned. Nearly all natural forests abound in unproductive areas, and in trees of very slight commercial value, which are as much weeds in the forest as Canada thistles are weeds in the corn-field. Man can produce a better commercial forest than Nature usually does.

"These forests may well belong to the people. Schools and towns could be supported by the proceeds of good community forests, at the same time that water-supplies could be conserved, wild animals protected, and the beauty and respectability of the country enhanced. When this time begins to come, the commonwealths that have rough lands will consider themselves to be fortunate. The United States government is well begun on this process, and this is right; but it is also necessary that the states and communities acquire forests in order to maintain their institutions and to develop local enterprise."

Our land resources.

The American has not yet reached the stage of really productive farming. His great wealth is mostly the product of many acres, many of them still in the first epoch of native fertility. This is to be expected in a new country, and particularly in one in which the area of good land has been greater than the population has needed for its support. We are familiar with the larger figures of acre yields for Europe than for America. We are now beginning to reach the end of the era of occupancy of new land, and our farming is beginning to increase in effectiveness. We may expect this increase soon to be sufficiently marked to find expression in statistics. How much to force the land to produce is an economic question, and we shall be able to increase the yields as rapidly as it becomes profitable to do so.

In North America, there is a wide ratio between land and population. The pressure for land will sometime be acutely felt, and we shall appreciate the value of every acre. It would be interesting to know the per capita quota of possibly cultivable land in the different countries. It is very difficult to secure exact comparable statistics, because so much of the land in some countries is inaccessibly mountainous or otherwise quite beyond the reach of the cultivator, and the exact proportion of this area is hard to determine. The definition of cultivable land is also likely to differ in different countries. It is difficult to determine what will be considered to be usable land in the future. Some countries, as England, are the centers of a colonial system and do not expect to be approximately self-supporting on their own land. The following figures give an approximate idea of the ratio of total land area to population in North America as compared with some European countries (mostly on basis of figures of about 1900):

	Acres per capita
Belgium	1.06
Netherlands	1.72
Italy	2.18
Germany	2.37
France	3.40
Continental United States (exclusive of Alaska)	24.02
In Canada: Nova Scotia	28.69
Ontario	65.09

SOIL WASTE AND SOIL DEPLETION AS A NATIONAL DANGER

By *E. W. Hilgard*

Until the last quarter of the past century, the national policy of the United States was the conquest of the wilderness and the rapid development of resources. Since 1875, it has become increasingly apparent that in the continuation of this policy, with the enormous increase and improvement of transportation and industrial activities, certain natural resources, such as forests and coal deposits, are being so rapidly encroached upon as to be in danger of exhaustion within comparatively limited periods. It is realized that they, together with the waterways and water-power of the country, must be conserved as national assets, and not be dealt with at the will of private interests alone. This view has become so widely accepted, and action thereupon is so obviously necessary to the continued prosperity of the nation, that legislative measures have already been inaugurated toward the enforcement of better economy.

Fig. 44. Sheep destroy forest cover and are thus often factors in soil depletion.

The need of similar attention to the natural agricultural resources of the country has thus far manifested itself chiefly in the establishment of the United States Reclamation Service. The main object of this service is the development, by provision for irrigation, as well as for drainage, of lands thus far unavailable for agriculture, and the increasing of the cultivable area. The conservation of the productiveness of lands already under cultivation or still unoccupied has so far found legislative recognition only in the establishment of forest reservations, the avowed purpose of which is mainly the maintenance of forest resources. The regular flow of streams is assured by the preservation of forest cover and by preventing the over-stocking of the forest pastures. To a certain extent, also, the over-stocking of open ranges has been taken into consideration.

The deterioration of lands falls naturally under two heads: First, mechanical waste of the soil stratum; second, depletion of plant-food by improvident cropping. Of these two, the first is the more immediately threatening and troublesome, and more widely destructive, because the damage that is thus inflicted is sometimes practically irremediable.

Waste of soils by washing away, or erosion.

The waste of soils by washing away is intimately connected with the influences already mentioned, viz., deforestation, defective cultivation, and over-stocking of pastures.

(1) *Deforestation.*—Forests conserve the soil layer partly by directly checking the velocity of heavy downpours of rain, but chiefly by the cover of leaves which, especially in deciduous forests, prevents any run-off of rain-water, and which retains the water long enough to allow it to soak into the ground to a large extent. This it will do readily, the more so because the ground is kept loose on the surface under the leaf-cover. The water that thus soaks in serves as a source of supply to permanent springs, and tends to maintain the volume of streams running throughout the season. Streams fed in such a manner do not pour down their devastating floods at one time, and then, at another time, dry out so as not to afford even drinking-water. It is, therefore, of the utmost interest to this country that this forest cover be maintained, and not destroyed by heedless burning over; which not only tends to injure the forest by scorching the tree-trunks and by destroying the young tree growth, but also by depriving the soil of its chief source of humus, which is so indispensable for successful culture.

In open forests, where the leaf-cover is not very dense, the grass growth affords considerable pasturage; the leaf-cover, together with the shrubby undergrowth and seedling trees, is frequently burned off in order to enable stock to get at the tender grass early in the season. This habit of burning-off the old vegetation is often pursued also in the open-plains country or prairies, for similar reasons.

The burning-off of the forest leaf-cover is not only dangerous but wasteful — dangerous to the forest, and wasteful in that it deprives the forest soil of humus-formation, and thus diminishes the nourishment for plant life. It is also injurious in case the land is to be cleared and taken into cultivation, for humus is one of the most important of soil ingredients. The same applies to the burning-off of the natural herbaceous growth of plains and prairies, and of that of fields as well. The looseness of the soil maintained by the presence of an abundance of humus favors the absorption of rain-water by the soil and diminishes the run-off. It also permits the proper circulation of air, ready root-penetration, and the beneficial activities of soil bacteria.

(2) *Defective cultivation.*—The diminution of the run-off is of special importance in hill lands, on which the washing away of the surface soil is the inevitable result of deforestation and careless,

shallow cultivation. In the humid region especially, the surface soil is by far the most important portion of the soil stratum; for, when the subsoil is laid bare, the productiveness of the land is at once diminished to such an extent that, for the time being, it will hardly repay cultivation. Then, but too frequently follows the "turning-out" of the land, probably with its dead-furrows open and running up and down hill. These dead-furrows will then quickly be enlarged by heavy rains, the water eating into the underlying layers until perhaps a stratum of loose sand is reached—as is the case in a large portion of the southwestern cotton states. When this is the case, every successive rain helps to undermine the soil stratum, causing large earthfalls to "cave" into the bottom of the wash. The next rains carry away a nondescript mixture of soil, subsoil, sand and gravel into the valleys, which soon become filled with the debris; the flowing streams are choked up and the valleys covered with materials sometimes wholly unavailable for ordinary culture plants.

In the meantime, the uplands themselves, originally level or gently undulating woodlands of high productiveness, have often been transformed into a maze of narrow, sharp-backed ridges, with not enough land in any one place to form a satisfactory homestead. Sections of roads and highways have been washed away, and these are now obliged to meander so as to follow the sharp ridges, which frequently offer but a scanty surface for the wheels of vehicles. In some cases, county seats and other towns, originally built on some attractive, parklike hill-plateau, have been encroached upon by the "red washes" to such extent that they have had to be moved away. Much of the once beautiful and profusely productive uplands bordering the lower Mississippi have been thus devastated, and similar destruction may be seen in the other cotton states. The practice of growing cotton on ridges thrown up without reference to the contour of the hills, together with the heavy rainfall of these states, has been largely instrumental in bringing about these inroads upon the cultivable area. The obvious preventive and remedy,—contour plowing and the digging of hillside ditches to carry off the water gently,—has generally been deferred until no more neighboring land, to be similarly mistreated, remains available. Thus the production of hundreds of thousands of acres has, in the southern states alone, been reduced from 350 to 400 pounds of lint cotton per acre, to less than one hundred or even to nothing. To a greater or less extent, similar waste has occurred all over the United States. The shallow plowing to the same depth, year after year, so generally practiced on new lands, has greatly contributed to the aggravation of these evils, by increasing the run-off from above the dense plowsole thus formed beneath the shallow surface layer.

(3) *Destruction of natural pastures by over-stocking.*—The most obvious result of pasturing excessive numbers of cattle, and especially of sheep, on natural pasture lands, has been the replacement of the desirable forage plants, that are naturally first eaten by the animals, by hardy weeds that are avoided by stock. The weeds thus easily gain precedence over the good pasture plants, often driving them out altogether. It is frequently impossible to renovate such weedy pasture lands without expensive cultural operations which "do not pay," so long as there is fresh pasture land to be occupied. The close pasturing done by sheep is especially destructive.

For a few years before abandoning the pastures, the stock is very likely to be fed partly on hay. The weed seeds in such hay are then scattered far and wide in the droppings of the pasturing animals. Thus dog-fennel, Canada and Russian thistle, pigweeds, docks and numberless other weeds are introduced, and not only render the pastures worthless, but become a source of worry and expense to the farmers who succeed the stockmen. In California, Napa thistles, weeds originally introduced from Spain, and the dog-fennel, have, over large areas, reduced the value of the coast-range pasture to less than half, some having become altogether worthless as such. The rapidly increasing shortage of the supply of beef cattle, which has raised the price of meat to a painful degree, is largely traceable to this deterioration of the pastures in the West.

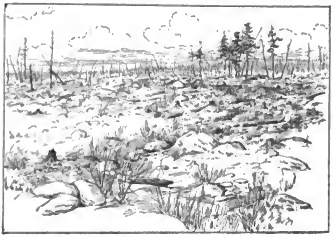

Fig. 45. Timber land that has been swept by a forest fire. There is no cover to prevent erosion.

Gullying from over-stocking.—Worse even than the replacement of the valuable pasture plants by worthless weeds is the total destruction of the land surface. This has occurred in some of the pasture lands of northern Texas, Arizona and adjacent regions, where at certain times in the year the protracted drought is broken by torrential downpours of rain on over-stocked pastures. The surface of such lands having been worn into a maze of descending trails converging toward water-courses or ponds, and deeply worn by the daily tramping of long lines of stock passing up and down once or twice daily, a heavy rain will at once convert these trails into rivulets or small torrents. These are then deepened by every subsequent downpour, the more readily as the wet trails are quickly deepened by the treading of stock. Soon a duplication of the gullying caused by careless cultivation in the states farther east results. According to the nature of the underlying strata, a network of gullies, or sometimes of great ravines, is formed, which the scant vegetation and rainfall of the arid regions cannot make available again. The once grassy rolling lands and plateaus, with a bright growth of spring flowers, have thus been transformed into desolate wastes less susceptible of reclamation than the desert itself, and, if not entirely bare of vegetation, so unattractive that neither man nor beast will occupy them.

This is perhaps the most thorough destruction of land by the carelessness of man that is to be found anywhere; and the damage thus brought about already extends over very large areas. It is less conspicuous in the Basin states and Montana because of the rarity of heavy downpours of rain.

What needs to be done.—It is obvious that the wasteful practices described, being easily avoidable, are due to ignorance, carelessness and improvidence, or to wilful disregard of the interests of succeeding settlers or generations. The injury to the producing capacity of the country thus ravaged is obviously of sufficiently serious import to justify the active intervention of preventive legislation, whether on the part of the United States, or the individual states concerned. The careless or intentional setting of fires was strictly forbidden by the territorial goverments of Montana and others, soon after the removal of the Indians. But, on the attainment of statehood, these beneficent laws often fell into innocuous desuetude, as the smoky atmosphere covering especially Oregon, Washington and Idaho during the dry season testifies,—a lamentable evidence of the waste of the precious timber and pasture resources of those states.

Depletion of soils by exhaustive cultivation.

While undoubtedly the greatest present danger to the agricultural prosperity of the United States arises from the mechanical wastes described above, there is another point of view which, while still largely ignored in the country west of the Mississippi river, has already become of serious and pressing concern east of the same. As in the case of the forests, the fertility of western soils was long proclaimed to be inexhaustible. But the infliction upon them of continuous cropping with one and the same plants, whether wheat, corn or cotton, resulted long ago in a diminution of production to one-half, one-third, or even to one-fourth of the crops obtained at first, whether on the black prairies of the Middle West and Northwest, in the rich soil of the blue-grass region of Kentucky, or on the Loess lands of our great western rivers. If it be contended, as it is by some, that this diminution of crops is due not to the withdrawal of soil ingredients by the plants, but to physical changes, the facts remain the same, as do the remedies. The simple principle that something cannot be indefinitely taken away from anything without diminishing the latter and finally depleting it of the matters taken away, seems to be the most rational explanation of diminished production.

It is true that the danger of ultimate soil-depletion is sometimes exaggerated, for, when we consider the total amounts of the several plant-food ingredients contained in most soils and at least potentially available for the future use of vegetation, we find them to be so great as to make total depletion appear very remote. We find it impossible to extract from soils all the matter soluble in water, and so it seems that at least small crops will continue to be produced on the most "exhausted" lands, year after year. This has been strikingly demonstrated at Rothamsted, England; where after more than fifty years culture without manure of any kind, an average of ten bushels of wheat is still grown on "exhausted" soil. However, the soil used had great native resources in plant-food; in lands originally poorer in plant-food the minimum crop would have been much less, and wholly unprofitable under present conditions of world-wide competition.

The permanent minimum production is thus essentially dependent upon the totals of plant-food present in soils, a proportional part of which is currently made available for plant use, partly by the progress of rock decay (weathering), partly by the direct action of plant roots and of their decaying remnants, which finally become humus. The "richness" of soils, so well recognized in the prices paid for them, is therefore a matter of prime interest to the farmer; and this can be ascertained by a rational system of chemical soil analysis. The physical conditions must, of course, be such as to permit of normal plant growth under practicable cultural conditions, which must be carefully maintained at all times.

Neglect of crop-rotation.—Next to the careless cultivation that has resulted in the washing away of the precious surface soil over immense areas, particularly east of the Mississippi river, the continuous growing of the same crop on the same fields has caused the greatest loss of national wealth and agricultural prosperity. The one-sided wear thus inflicted on the generously fertile soils of the West has placed almost entire states in the same category as a grindstone that is constantly used on one side only. The rehabilitation of such a grindstone is troublesome and expensive; and it is just so with the land. A heavy initial outlay is often required before profitable production can be restored, even of other crops; the more so because, usually, the washing away of the soil has accompanied the irrational practice of one-sided soil-wear.

Removal of soil ingredients by cropping.

The soil ingredients taken up by a crop that is sold are definitely removed from the land; if they were all returned annually by plowing-in the crop, the land would be constantly improving. The least the farmer ought to do is to return to the land all the unsalable offal in effective shape, either directly or as stable manure. Instead, the practice of the pioneer farmer has mostly been to get rid of such offal in some other way, commonly by burning. The land has thus been deprived of the return of both nitrogen and humus, even if the ashes have been returned. This process of heedless depletion has usually been continued until the land has become unsatisfactory to the settler, who either sells it to the next comer for what it will bring, or simply abandons it. The same ruinous method is still being pursued in a large part of the Far West.

The most glaring example of enormous and easily avoidable waste of soil fertility was probably that of the early cotton-planters of the South, whose crop of cotton lint carried off less than one-twentieth of the total of plant-food taken from the soil by the cotton plant. This small amount would, in any fairly productive land, be made up by the "weathering" of the soil during the season. For many years before the Civil war this seed-crop was considered and treated as an unmitigated nuisance, and was burned, hauled to a distance or thrown into the streams to get rid of it. It was as though, in the case of corn, the shucks only were used and the rest thrown away. No wonder that with this stupendous waste of precious soil fertility, the cotton lands of the South became depleted, and the planters moved to the great Mississippi bottom, where production was high and where it was easier to throw cottonseed into the bayous, to be carried down to the Gulf of Mexico.

Fortunately, this fearful waste has now been almost stopped by the introduction of the cottonseed-oil industry and the use of the oil-cake, or of the seed as a whole, for fertilization. But large portions of the fairest upland cotton lands of the South have by such improvident cultivation been so deteriorated that only "poor whites" or negroes will try to make a scant living where large, prosperous planters once had their mansions. The loss of national wealth incurred in this manner alone, by decreased production and depreciation of land values, must be estimated by at least hundreds of millions. The corresponding statistics of other crops would swell these figures into the billions, for the salable portions of most of those ordinarily grown, carry off much larger amounts of plant-food than does cotton lint.

Humus.

As regards the several important soil ingredients, the first one to be usually diminished to a serious extent in pioneer farming is the humus of the soil. This is true not only where, as in the hill lands, the surface soil containing it is permitted to be washed away, but also in the level prairie lands, where little or no such washing occurs. The loss of humus occurs through cultivation, whereby, unless rotation or green-manuring is practiced, the natural process of humus-formation is done away with, while the exposure of the surface soil to the influence of air and sun-heat causes the humus to be almost literally burnt out of the land. This loss of humus (which has been perhaps most strikingly demonstrated by Snyder in the great wheat-growing region of the Red River of the North) not only results in a compacting of the surface soil which renders good tilth very difficult, but at the same time causes a very serious loss of nitrogen, of which soil-humus is the repository. Thus, enormous quantities of this most expensive and indispensable element of plant-food are lost, and the beneficial activities of soil-bacteria seriously impaired. The falling-off in production, due to such loss of humus, is probably greater than in the case of any other single soil ingredient; and unfortunately it is practically more difficult, and takes more time, to recoup the land in this respect than in any other.

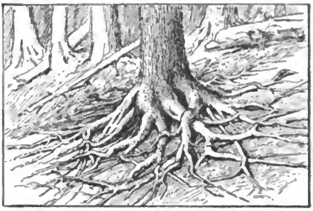

Fig. 46. The roots of a hemlock tree laid bare by fire that destroyed the leaf-cover.

But even when the leaf-fall or other crop remnants returned to the soil prevent the actual decrease of the humus content, the nitrogen content, and therefore the agricultural value of the humus itself, may be so far decreased by exhaustive cropping as to render it incapable of supplying, currently, enough for the thrifty growth of plants. Thus, the nitrogen content of humus containing originally over 18 per cent of the same, was, by twelve years' continuous growth of ramie, the falling leaves of which more than maintained the total of humus, diminished to less than 4 per cent. Ramie at last would not grow without the addition of nitrogenous fertilizers. Wheat draws upon the humus-nitrogen even more heavily than ramie, hence the falling off of grain-production is probably due both to the loss of humus as such, and its progressive depletion of nitrogen.

In the arid regions, the burning-out of humus from the pervious surface soil during the long, hot and rainless summers is so great that quite commonly the humus-content of the upper six inches of the land is less than that of the soil farther down. This, however, is not a very serious loss, because in arid climates the feeding roots of almost all plants are located below the dry and hot surface layer, which serves mainly as a surface-mulch conserving moisture. From this cause, the washing away of the surface soil, which is so fatal to production in the regions of summer rains, is much less injurious to lands of the arid regions, even though very undesirable there. The subsoil that is

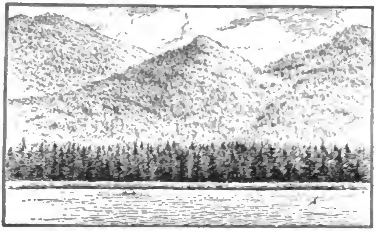

Fig. 47. The heavily timbered region of southeastern Alaska.

laid bare by erosion is nearly as good as that which originally formed the surface; the comparative scarcity of humus is largely compensated by the higher content of nitrogen in the humus itself.

Potash, phosphoric acid, and lime.

Unlike humus and nitrogen, potash, phosphoric acid and lime are not restricted to the surface soil; therefore, the waste of the latter does not deplete the land to the same extent. But while it frequently happens that the subsoil is richer in these substances than the surface soil, the latter nevertheless usually contains the larger proportion of readily available compounds. Hence the "rawness" of a bared subsoil is connected also with a lack of readily assimilable mineral plant-food, which it may take years, and the restored action of humus, to relieve; unless, indeed, they are added in the form of commercial fertilizers. It has, however, been abundantly shown by painful experience that these mineral fertilizers alone, without the addition of humus, will not maintain profitable production. Therefore, in this respect also, the waste of the surface soil is a grievous economic loss, which concerns the national welfare as well as that of the individual farmer.

Improvident culture in the past has necessitated the expenditure of enormous sums on the purchase of commercial fertilizers; of which one ingredient, potash, must be wholly imported from Germany; while for the chief source of nitrogen, Chile salt-peter, we have been tributary to South America. It is now becoming widely known that the growing of leguminous crops from time to time will render the outside purchase of nitrogen unnecessary, though it may be supplemented from slaughterhouse offal obtained within our own territory. From the same source, and from our phosphorite beds, we can replenish the phosphates sold off the lands in crops.

But the greater part of this enormous expenditure could have been avoided if more rational methods of cultivation had been practiced earlier. The depression of farming enterprise that naturally follows the reduction of wheat production from thirty-five or forty bushels per acre to ten or eleven, with a corresponding reduction in the corn-crop, and the resulting turn-out of the depleted land to be wasted by erosion, while not always avoidable in pioneer times, are no longer excusable. The competition with the entire world now renders National intensive methods of agriculture necessary, and will greatly help to prevent the migration cityward of the most ambitious of our farming youth, by the interest naturally excited by the teaching of rational methods in schools and colleges. Thus we may hope that the reckless depletion of agricultural lands, to be followed by costly reclamation operations, will soon be replaced by the systematic maintenance of productiveness in the United States and Canada, as it now is practiced in Europe.

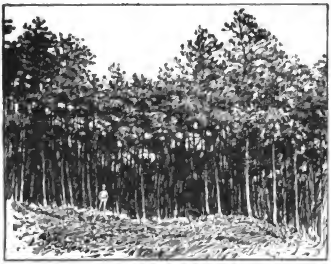

Fig. 48. A grove of pitch pine. Estimated to be about fifty years old.

FOREST RESOURCES

Forests and grass are the only fundamental plant resources that come natively to the hand of the settler in North America. We have appreciated the importance of neither of these. Grass is readily renewed in most regions; but renewal of forests requires years of time and is often set with peculiar difficulties. Now that we have run over the continent and begin to see the end of exploitation, we have come to a realization of what forests mean to us. In Vol. II the subject has been treated from the cropping point of view. We now consider, in a series of articles, some of the public welfare aspects of the forests.

The utilizing of forest resources is necessarily closely associated with plans of governmental supervision, whether local, state or national. Such plans are considered in the articles by Zon [page 144], Chapman [page 148], Pinchot [page 152].

In Canada, the Dominion owns practically all the timber-lands in the central provinces, unorganized territories, and in the railway belt of British Columbia. The other provinces own and administer their timber-lands as "crown-lands." A conservative policy has been begun by the Dominion government by the institution of a Forestry Branch, now employing professional foresters, and setting aside forest reservations, and providing a fire-ranger system in these reservations. Such reservations and fire service are also in existence in the provinces of Ontario and Quebec. The latter has, in 1907, reserved practically all its timber-lands not under license, and has instituted an organization for their management. The agitation for an extension of this movement has been widespread, especially during the last winter, since the University of Toronto, a government institution, has created a Faculty of Forestry. A Chair of Forestry has also been instituted in the province of New Brunswick.

Forests as the Source of the Timber Supply.

By *R. S. Kellogg.*

It is unquestionably true that the forests that originally existed in the United States and Canada exceeded in the quantity, variety, and usefulness of their timber the forests of an equal area anywhere else on the globe. Not only did these forests contain the largest trees that ever grew on the planet, but they were also remarkable in that their products were suited to every purpose for which wood is used in any considerable quantity. Botanists distinguish some five hundred tree species in the United States, of which thirty or forty are of commercial importance.

Forest regions. (Fig. 10, Vol. I.)

Five great types of forests are recognized in the United States, the northern, southern, central, Rocky mountain, and Pacific coast. The northern, Rocky mountain and Pacific regions extend into Canada, and that country is rich in forest supplies [Cf. article on life-zones, Vol. I, pages 20–28].

In the northern forest, coniferous species originally predominated, white pine, red or Norway pine, spruce, hemlock, tamarack, and white cedar or arborvitæ. Associated with these conifers were several of the hardier broad-leaved trees, particularly the birches and aspens. The northern forest stretches from Maine down through New England and across New York, Michigan and Wisconsin to Minnesota, with a southern extension over Pennsylvania and along the higher portions of the Appalachians to northeastern Georgia. Heavy cutting began at an early day and has continued until only remnants of this magnificent forest remain. In the history of the lumber industry of America the name of Maine will long be synonymous with that of spruce, Pennsylvania with hemlock, and Michigan with white pine.

The southern forest is also a coniferous one, and here it is that the yellow pines reach their maximum development, the loblolly pine predominating in Virginia and the Carolinas, the long-leaf pine covering large areas from Georgia and Florida to eastern Texas, with the short-leaf pine most abundant in Arkansas and southern Missouri. In the swamps of Louisiana and other southern states there is much cypress and red and tupelo gum. The southern forest has been heavily cut within the last twenty years and its maximum output has probably been reached.

Lying between the northern and southern forests, with extensions into both, and, limited on the west by the eastern edge of the great plains, is the central forest, the great hardwood region of the country and the only one in which hardwood or broad-leaved trees predominate. Here once flourished a wonderful profusion of useful woods,—oak, hickory, yellow poplar, elm, ash, maple, chestnut, basswood, walnut, sycamore, and others. Much of this forest grew upon agricultural land, and it has given way before the axe of the settler and the demands of commerce until the only considerable quantities of virgin hardwoods left are in the southern Appalachians, and they are being rapidly attacked.

The Rocky mountain forest occupies the higher elevations from Montana and Idaho to Arizona and New Mexico. Western yellow pine and Douglas fir are widely distributed through the region, with much lodgepole pine and spruce and some giant arborvitæ, larch, and white pine in the northern portion. Several other conifers are abundant locally, together with various hardwoods which do not ordinarily attain the dimensions of saw timber. The Rocky mountain forest as a whole has not yet been heavily cut, but, until the establishment of national forests in recent years, it suffered most severely from repeated and extensive fires.

The Pacific coast forest contains the largest trees and the heaviest stands of timber ever recorded by history or revealed by geology. The Douglas fir, redwood, western yellow pine, giant arborvitæ (locally called "red cedar"), sugar-pine, spruce, and western hemlock reach their maximum development in Washington, Oregon, and California. The Pacific forest contains more virgin timber than any other region of the United States, and with conservative management it will be the most important source of our timber supply for many years to come..

Stumpage estimates and forest areas.

No satisfactory data upon the amount of standing commercial timber in the United States have ever been collected. The magnitude of the task has so far prevented the making of anything more than fairly accurate determinations for small areas, and very crude estimates for the country as a whole. The most widely quoted estimate, perhaps, is that of the Twelfth Census in 1900, which gave a total of 1,390 billion board feet, of which 300 billion feet were credited to the hardwoods as a class, 300 billion feet to the southern yellow pines, 300 billion feet to Douglas fir, 125 billion feet to western yellow pine, 100 billion feet to hemlock, and smaller quantities to various other woods. The highest current estimate is that published by B. E. Fernow, in 1902, which is very general. The northern states are estimated by Mr. Fernow to have 500 billion board feet of standing timber, the southern states, 700 billion feet, and the western states, 800 billion feet—a total of 2,000 billion feet.

Our knowledge of the extent of our forest areas is no more exact than that of our standing timber. The estimates run from 500 million to 700 million acres. The accompanying table gives the total wooded area, as estimated by the United States Geological Survey, together with the national and state forest reserves, and, based upon these figures, a computation of the area of the private or non-reserved public forests. The figures for state and national forests are exact, but the others are crude and subject to much modification. Not all of the land included within the boundaries of forest reserves bears commercial timber, and in Kansas and Nebraska there is no timber in the national forests, as these reserves were created for the purpose of planting timber upon land which is considered to be more suitable for tree growth than for ordinary agricultural crops. This explains certain discrepancies in the table.

FOREST AREAS.

STATES	Total wooded area	National forests	State forests	Private and unreserved public forests
	Acres	Acres	Acres	Acres
Alabama	24,512,000	. . . . . .	. . . . . .	24,512,000
Arizona	16,000,000	12,759,190	. . . . . .	3,240,810
Arkansas	28,800,000	1,991,899	. . . . . .	26,808,101
California	28,608,000	25,605,709	. . . . . .	2,992,291
Colorado	21,440,000	15,746,932	. . . . . .	5,693,068
Connecticut	1,216,000	. . . . . .	1,400	1,214,600
Delaware	448,000	. . . . . .	. . . . . .	448,000
Florida	24,128,000	. . . . . .	. . . . . .	24,128,000
Georgia	26,880,000	. . . . . .	. . . . . .	26,880,000
Idaho	22,400,000	20,336,427	. . . . . .	2,063,573
Illinois	6,528,000	. . . . . .	. . . . . .	6,528,000
Indiana	6,912,000	. . . . . .	2,000	6,910,000
Iowa	4,480,000	. . . . . .	. . . . . .	4,480,000
Kansas	3,648,000	97,280	. . . . . .	3,648,000
Kentucky	14,208,000	. . . . . .	. . . . . .	14,208,000
Louisiana	18,112,000	. . . . . .	. . . . . .	18,112,000
Maine	15,168,000	. . . . . .	. . . . . .	15,168,000
Maryland	2,816,000	. . . . . .	1,957	2,814,043
Massachusetts	2,688,000	. . . . . .	. .	2,688,000
Michigan	24,320,000	. . . . . .	39,000	24,281,000
Minnesota	33,408,000	294,752	21,000	33,092,248
Mississippi	20,672,000	. . . . . .	. . . . . .	20,672,000
Missouri	26,240,000	. . . . . .	. . . . . .	26,240,000
Montana	26,880,000	20,402,676	. . . . . .	6,477,324
Nebraska	1,472,000	556,072	. . . . . .	1,472,000
Nevada	3,904,000	2,591,052	. . . . . .	1,312,948
New Hampshire	3,328,000	. . . . . .	. . . . . .	3,328,000
New Jersey	2,069,760	. . . . . .	9,867	2,059,893
New Mexico	15,168,000	8,408,646	. . . . . .	6,759,354
New York	11,968,000	. . . . . .	1,548,450	10,419,550
North Carolina	22,592,000	. . . . . .	. . . . . .	22,592,000
North Dakota	384,000	. . . . . .	. . . . . .	384,000
Ohio	5,952,000	. . . . . .	. . . . . .	5,952,000
Oklahoma	15,616,000	60,800	. . . . . .	15,555,200
Oregon	34,752,000	16,331,892	. . . . . .	18,420,108
Pennsylvania	14,848,000	. . . . . .	761,000	14,087,000
Rhode Island	256,000	. . . . . .	. . . . . .	256,000
South Carolina	13,120,000	. . . . . .	. . . . . .	13,120,000
South Dakota	1,600,000	1,263,720	. . . . . .	336,280
Tennessee	17,472,000	. . . . . .	. . . . . .	17,472,000
Texas	40,960,000	. . . . . .	. . . . . .	40,960,000
Utah	6,400,000	7,415,832	. . . . . .	. . . . . .
Vermont	2,496,000	. . . . . .	. . . . . .	2,496,000
Virginia	14,976,000	. . . . . .	. . . . . .	14,976,000
Washington	30,528,000	12,065,500	. . . . . .	18,462,500
West Virginia	11,776,000	. . . . . .	. . . . . .	11,776,000
Wisconsin	20,320,000	. . . . . .	300,000	20,020,000
Wyoming	8,000,000	8,998,723	. . . . . .	. . . . . .
Total	700,469,760	154,927,102	2,684,674	545,515,891

Forest Products, 1906	Quantity	Value
Lumber (feet B. M.)	40,000,000,000	$650,000,000
Firewood (cords)	100,000,000	350,000,000
Shingles and lath	. . . . . .	37,000,000
Hewed cross-ties (number)	78,000,000	35,000,000
Cooperage stock	. . . . . .	32,000,000
Turpentine and rosin	. . . . . .	25,000,000
Pulpwood (cords)	3,000,000	15,000,000
Tanbark and extract	. . . . . .	10,500,000
Telephone and telegraph poles (number)	4,000,000	9,000,000
Round mine timbers (cubic feet)	170,000,000	7,500,000
Timber exported (unsawed)	. . . . . .	5,000,000
Wood used for distillation (cords)	1,200,000	3,500,000
Wood used for veneer (feet B. M.)	350,000,000	3,000,000
Maple sugar and syrup	. . . . . .	2,500,000
Posts, piles and other products	. . . . . .	15,000,000
Total	. . . . . .	$1,200,000,000

Forest products.

A more adequate idea of the original extent of the forest resources of the United States is obtained when we bring together the figures upon forest products during the past half century, and, using them as a basis, estimate the total drain upon the forests. The census of 1880 was the first to give the quantity of lumber manufactured in the United States, and it was not until 1900 that the cut by species was obtained. Previous to 1880, only the value of forest products was reported. It may be conservatively stated that the lumber production since 1850, for the years in which data are available, was, in round numbers, as follows:

Year	Million board feet	Year	Million board feet
1850	5,000	1890	23,500
1860	8,000	1900	35,000
1870	13,000	1904	35,000
1880	18,000	1906	40,000

It is easily calculated, therefore, that the total amount of lumber cut from our forests since 1850 has been more than one thousand billion board feet, a quantity that passes the bounds of comprehension; suffice it to say that it would cover an area of 23,000,000 acres with a floor one inch thick, or build a walk one hundred feet wide and eight inches thick from the earth to the moon. Assuming, as may be safely done, that the wood used since 1850, in the form of lumber, is no more than equal to the amount used for a multitude of other purposes and destroyed by fire, the total drain on our forests in the last fifty-seven years has been equivalent to two thousand billion board feet, which is the highest estimate of our standing timber today.

The total output of forest products in 1906, the last year for which fairly complete figures are available, and the greatest output ever recorded, is estimated by the Bureau of the Census and the Forest Service to have been as given in the table at top of this page.

The same authorities give the lumber production in 1906, by species and states, as shown in the two following tables, the value in each case being that at the point of production. It will be noted that in these tables the total lumber production is given as 37,550,736,000 feet, while in the preceding table it is given as 40,000,000,000 feet; the former figure is the one actually reported by the lumber manufacturers, the latter the estimated cut, allowing for deficient reports:

PRODUCTION OF LUMBER BY SPECIES, 1906.

Kind	M feet	Per cent	Total value	Value per M feet
Yellow pine	11,661,077	31.1	$175,178,446	$15 02
Douglas fir	4,969,843	13.2	70,567,141	14 20
White pine	4,583,727	12.2	83,952,701	18 32
Hemlock	3,537,329	9.4	54,153,242	15 31
Oak	2,820,393	7.5	61,377,266	21 76
Spruce	1,644,987	4.4	28,515,439	17 33
Western pine	1,386,777	3.7	19,423,937	14 01
Maple	882,878	2.4	13,714,083	15 53
Cypress	839,276	2.2	18,403,392	21 94
Poplar	683,132	1.8	16,538,260	24 21
Redwood	659,678	1.8	10,978,759	16 64
Red gum	453,678	1.2	6,102,886	13 46
Chestnut	407,379	1.1	7,128,864	17 49
Basswood	376,838	1.0	7,029,950	18 66
Birch	370,432	1.0	6,384,705	17 24
Cedar	357,845	1.0	6,484,600	18 12

PRODUCTION OF LUMBER BY SPECIES, continued

Kind	M feet	Per cent	Total value	Value per M feet
Beech	275,661	.7	3,873,436	14 05
Cottonwood	263,996	.7	4,525,565	17 15
Elm	224,795	.6	4,066,035	18 08
Ash	214,460	.6	5,222,477	24 35
Larch	166,078	.4	1,978,709	11 91
Hickory	148,212	.4	4,508,583	30 42
Sugar-pine	133,640	.4	2,152,662	16 11
Tamarack	123,395	.3	1,926,627	15 63
White fir	104,329	.3	1,346,317	12 91
Walnut	48,174	.1	2,033,718	42 25
Tupelo	47,882	.1	676,476	14 13
All others	164,845	.4	2,907,112	17 63
Total	37,550,736	100.0	$621,151,388	$16 60

PRODUCTION OF LUMBER BY STATES, 1906.

STATE	M feet	Per cent	Total value	Value per M feet
Washington	4,305,053	11.5	$62,162,840	$14 44
Louisiana	2,796,395	7.4	46,460,499	16 61
Wisconsin	2,331,305	6.2	39,997,360	17 16
Michigan	2,094,279	5.6	33,357,883	15 93
Mississippi	1,840,250	4.9	30,950,278	16 81
Arkansas	1,839,368	4.9	29,657,784	16 12
Minnesota	1,794,144	4.8	31,243,835	17 41
Texas	1,741,473	4.6	26,111,477	14 99
Pennsylvania	1,620,881	4.3	29,804,260	18 39
Oregon	1,604,894	4.3	22,358,673	13 93
California	1,348,559	3.6	20,726,799	15 37
North Carolina	1,222,974	3.3	19,066,437	15 59
Maine	1,088,747	2.9	18,369,334	16 87
Virginia	1,063,241	2.8	16,187,028	15 22
Alabama	1,009,783	2.7	15,706,600	15 55
West Virginia	976,173	2.6	18,245,195	18 69
Florida	888,137	2.4	15,538,716	17 50
Georgia	831,675	2.2	12,792,888	15 38
New York	810,949	2.1	17,241,866	21 26
Kentucky	661,299	1.8	13,170,127	19 92
Tennessee	634,587	1.7	13,485,630	21 25
South Carolina	566,928	1.5	8,959,042	15 80
New Hampshire	539,259	1.4	8,356,002	15 50
Missouri	507,084	1.3	8,025,223	15 83
Indiana	447,808	1.2	11,044,323	24 66
Ohio	438,775	1.2	10,589,568	24 13
Idaho	418,944	1.1	5,966,157	14 24
Massachusetts	354,483	.9	5,507,655	15 54
Vermont	329,422	.9	5,474,004	16 61
Montana	328,727	.9	4,330,834	13 18
Maryland	219,098	.6	3,755,439	17 14
Iowa	163,747	.4	3,723,915	22 74
Illinois	141,374	.4	3,073,482	21 74
Connecticut	121,880	.3	2,300,427	18 42
Colorado	110,212	.3	1,359,258	12 33
New Mexico	103,079	.3	1,935,686	18 78
Arizona	56,960	.2	875,886	15 38
Indian Territory	48,694	.1	635,417	13 05
Delaware	44,487	.1	545,219	12 26
New Jersey	36,253	.1	921,536	25 42
South Dakota	22,634	.1	350,254	15 87
Rhode Island	21,528	.1	377,243	17 52
Wyoming	13,213	Less than 0.1 per cent	197,943	14 99
Utah	7,768		118,176	15 21
All others (Kansas and Oklahoma)	1,213		84,190	77 00
Total	37,550,736	100.0	$621,151,388	$16 60

The maximum output of forest products in the United States has been reached, and, with certain classes and species, it has been passed. The maximum cut of white pine, for instance, occurred in the early nineties, and the decrease from 1900 to 1906 was 40 per cent; during the same period the decrease in yellow poplar was over 38 per cent, and that in oak, 36 per cent. On the whole, the output of hardwoods is steadily falling off, and a serious shortage in these woods is facing the country. The cut of southern yellow pine has increased strongly until recently, but its turning-point is now near at hand, if not already passed. The output of western yellow pine and Douglas fir will increase for some time under normal conditions, and it is to the latter species, especially, that we must look for much of our future lumber supply. In this connection, it is interesting to note the following table upon the geographical distribution of the total lumber product at census dates.

Year	Northeastern states	Lake states	Southern states	Pacific states
	Per cent	Per cent	Per cent	Per cent
1850	54.5	6.4	13.8	3.9
1860	36.2	13.6	16.5	6.2
1870	36.8	24.4	9.4	3.8
1880	24.8	33.4	11.9	3.5
1890	18.4	36.3	15.9	7.3
1900	16.0	27.4	25.2	9.6
1904	13.2	19.3	39.6	13.3
1906	13.2	16.5	37.2	19.3

More in detail, Michigan furnished 23 per cent of the lumber production of 1880, and but 5.6 per cent of that in 1906; Pennsylvania 9.5 per cent in 1880, and 4.3 per cent in 1906, and New York, 6.5 per cent in 1880, and 2.1 per cent in 1906. On the other hand, Mississippi rose from 0.9 per cent in 1880 to 4.9 per cent in 1906; Louisiana from 0.7 per cent to 7.4 per cent; Arkansas from 1.0 per cent to 4.9 per cent; Texas from 1.8 per cent, to 4.6 per cent, and Washington, which produced but 0.9 per cent of lumber cut in 1880, furnished 11.5 per cent of the output in 1906. These figures clearly show the shifting of the sources of lumber supply in the United States, and they record the manner in which every new region is attacked as the older one is cut out. Now we have reached the point where every region is being heavily drawn upon, the second-growth timber in the earlier ones and the original timber in the newer regions, and this at once brings up the question: "How long will our timber supply last at the present rate of cutting?"

Life of present timber supply.

Three factors must be known before we can forecast the time within which our timber supply will be exhausted. These are, (1), the present stand, (2), the annual growth, and (3), the annual consumption. On these points our data are incomplete, yet they point to certain general conclusions. As previously mentioned, the estimates of stumpage range from approximately 1,400 billion to 2,000 billion feet. The annual growth is perhaps 30 or 40 billion feet, and the annual consumption of timber in all forms may be equivalent to 100 billion feet. This would indicate an exhaustion of the timber supply in about thirty years, were present tendencies to continue unchecked, and it is upon estimates like these that the wide-spread cry of an impending "timber famine" is based.

The term famine is, after all, a relative one. If by it we mean a condition in which the demand for a commodity exceeds the supply, and, in consequence, the price rises and consumption is restricted, then we may truly say that a famine has already begun with certain of our important woods —white pine, oak, yellow poplar and hickory, for example—and that such a condition will later occur in other woods. We have long been cutting and destroying our forests far in excess of their annual increment, and there can eventually be only one result of such a course—a greatly lessened output.

Of course, no one believes for an instant that our timber will be utterly exhausted, but we shall have to pay the penalty of mismanagement by being forced to depend upon timber inferior in quality and deficient in quantity. As a nation, we have used timber wastefully and extravagantly. In many cases it was originally an encumbrance upon the ground and needed to be removed to make way for settlement and ordinary agricultural operations. So it came naturally to be regarded as not worth husbanding for future needs. No figures are needed to tell us that within a comparatively few years, as measured by the life of a nation or a forest, we shall be forced to pay much more for the timber we use and to get along with lower grades than was formerly the case. History and observation show this to be true. The great pineries of Michigan were once called "inexhaustible," and for over 20 years that state was first in lumber production. It is estimated that the value of the lumber cut in Michigan exceeds by 50 per cent the output of gold in California since 1849—and now millions of acres of cut-over land are on the delinquent tax list, and the state must take years of time and be at heavy expense to reforest a small portion of its original forest area. Fifteen or twenty years hence will see the great bulk of the southern yellow pine cut, and heavily increased drains upon the Pacific coast forests will have greatly reduced their volume.

An encouraging feature of the situation is that, as timber becomes higher priced, it is utilized more economically. At present but little more than half the wood in a log goes into lumber, and much of the remainder is wasted. By the introduction of more saving methods of manufacture and the making of by-products, the timber supply will eventually be much better utilized. The rapid growth in the manufacture of veneer from a large number of native woods, and the widely increased use of veneer and built up structures are cases in point. The life of timber in use will also be greatly lengthened by means of preservatives. A rapid increase will take place in the preservative treatment of railroad ties, mine timbers, piling, poles, posts, and other timbers which are used in situations where decay or damage by insects or marine borers is particularly liable to occur.

The timber supply of the future.

There is no doubt but that the forest area or the area that is better adapted to timber production than to any other purpose of the United States is sufficient to produce eventually all the timber that will be really needed. It is a question of the application of the right methods, of specialized agriculture, for, after all, timber is only an agricultural crop which requires a long time to produce—one in which the harvests are years instead of months apart. The timber that exists in the United States today and which was cut in the past was produced by nature in the face of obstacles imposed by man; that of the future must largely come from man's effort to assist nature. In other words, cultivation must replace exploitation. The rising prices of forest products will make this profitable and consequently possible, for the production of the country's timber supply must rest on a business basis, however much we may appreciate the esthetic features of the forest. When it is fully realized that in certain instances it will pay private individuals and corporations to grow timber, and that in other cases it is a matter of economic necessity for the states and the nation to conserve forests for timber production and watershed protection, we may expect adequate measures to be taken to perpetuate our forest resources.

Upon this basis we may predict that the future timber supply of the United States will come from three sources: (1) Farm woodlots, (2) areas managed or planted for the production of timber by large companies and corporations, and (3) national and state forests. A woodlot of either planted or native timber is a valuable adjunct to every well-managed farm, and, in the aggregate, the amount of timber derived from such sources will be considerable. It will, of course, chiefly supply domestic and local needs. Timber that is planted by small owners will be principally of the rapid-growing kinds that can be profitably utilized in small sizes and within a comparatively few years after planting, otherwise the investment required is too long. The planting in suitable situations of catalpa, black locust, and European larch for posts and poles, and of cottonwood and white pine for boxboard material, are examples of this kind. (Figs. 48, 49 and 53.) Large owners of timberland, such as some companies and corporations now in existence and others that will be formed, can be expected to put their forests on a permanent producing basis and so become a considerable factor in supplying timber for commerce. The time element will be less pressing with them than with the smaller owners, and they can afford to produce larger-sized material.

Finally, the national and state governments will be the most important agencies of all in maintaining our forest resources. Beginning in 1891, the national government has set aside over 154,000,000 acres of land (exclusive of Alaska) which is chiefly valuable for timber production and watershed protection, and several states have secured by purchase or donation nearly 2,700,000 acres of forest land, all of which will eventually be brought to the highest producing capacity. This represents 22 per cent of the estimated forest area of the country, and the proportion will undoubtedly be considerably increased in the future.

While there are most certainly lean years ahead in our timber supply, the final outlook is by no means dark. The perpetuation of our forest resources, however, calls for full and intelligent action by individuals, by the states, and by the nation, and the solving of the many problems connected with it offers a field for the best efforts of the forester, the political economist, and the statesman.

Forest Resources of Canada.

By *B. E. Fernow.*

Canada has the reputation of being a great forest country, perhaps the best wooded country in the world. If by such statements the idea is to be conveyed that the larger part of the land area is or has been covered by tree-growth of some sort, this may be true, for of the three million five hundred thousand square miles or more, which the Dominion boasts, probably over 50 per cent is woodland. Less than two hundred thousand square miles in the southern central part are open grassy prairie or plains, and an unmeasured area, probably over one million square miles, north of a sinuous line from Fort Churchill to the mouth of the Mackenzie river, very closely corresponding to the summer isotherm of 50° Fahr., are known as the treeless "barrens." If, however, not merely woodland condition but commercially valuable forest-growth is considered, i. e., land covered with or capable of producing timber of saw-mill size, located in sufficient area and accessible for commercial exploitation, hardly two hundred million acres may answer that description, much of which is culled of its best timber and much of it burned. Precise knowledge regarding the extent and condition of the timber resources, to be sure, does not exist even for the settled parts, and vast areas in the Northwest territories are still unexplored except along river courses. A knowledge of climatic, geological and topographical conditions, and partial knowledge of actual forest conditions, permits the above estimate.

The timber, which is found scattered over the northern country, much of it devastated by fires, is mostly of inferior character and all needed for local use eventually. There are not anywhere, as in the United States, extensive contiguous areas of good timber; such timber occurs, as a rule, scattered among poorer areas.

Forest regions.

As in the United States, floristically two regions may be recognized, namely, the Pacific and the Atlantic forests. Within these, a number of subtypes are found.

The provinces of Nova Scotia and New Brunswick, with the eastern townships of Quebec, south of the St. Lawrence river, form a region by themselves which may be called the Acadian region, a continuation of the Appalachian mountain system, wooded similarly to the state of Maine, spruce being the main commercial timber. The St. Lawrence river valley, from Lake Huron to the mouth, can be differentiated into three subtypes: The peninsula of Ontario represents the rich varied hardwood type of the middle states and Michigan, once of magnificent development but now mostly removed to make room for farms. Here, local scarcity of wood is being experienced. A less varied hardwood forest, mixed with conifers, covers the second division along the shores of Lake Ontario and the upper St. Lawrence and lower Ottawa valleys as far as Quebec, also mostly removed or culled of its best values. The lower St. Lawrence valley from Quebec east, varying in width from six to twenty miles, shows a further reduction of hardwood species and prominence of conifers.

North of the St. Lawrence valley extends to the Arctic seas the "Laurentian plateau," the oldest land area of the North American continent of Archæan rocks, little diversified topographically; the "Height of Land," a low line of hills and ridges, forming the dividing line between the watersheds of the St. Lawrence and Hudson bay. The area of the southern slope of this plateau is the principal forest region of Canada at present, the provinces of Quebec and Ontario sharing about equally in it, with Ontario somewhat in the advantage as to the character of growth. It is a coniferous forest with admixture of hardwoods, mainly maple and paper birch; white and red pine are largely cut out, but spruce and balsam, especially in Ontario, are mostly still untouched. Beyond the "Height of Land" the timber pines soon drop out, except along the upper river courses, and the great Northern forest of spruce, balsam, larch, with aspen and balsam poplar, and on the poorer gravels Banksian pine, stretches across the continent to the Rocky mountains and the mouth of the Mackenzie river.

In the Pacific forest, great local variation exists because of rainfall conditions, the western slopes being humid, the eastern dry to arid. An arid interior plateau corresponds in character to the interior plateau of the United States. The coast timber, red fir, cedar, hemlock, spruce, celebrated for its magnificent development, occupies the lower slopes and valleys of the coast in a belt rarely over fifty miles inland, ascending to altitudes of 1,500 to 2,500 feet for two hundred miles along the coast, probably not over six million acres. A northern extension of simpler composition (hemlock and spruce) and poorer development, and some good timber on the higher slopes, increase the acreage of good timber to twelve or fifteen million acres, which may bring the amount of merchantable timber in this coast forest to perhaps two hundred and forty billion feet. The southern tier of the Rocky mountains, below the 53° latitude, contains another twelve to fifteen million acres of merchantable timber (pine, spruce), which may add sixty billion feet. The remainder is either inaccessible or too poor except for strictly local use, especially in the northern part, which is mainly lodgepole pine.

In the whole of Canada it will be difficult to find six hundred billion feet of saw material, while there are still unmeasured quantities of pulpwood.

On the thin soils of the Laurentian plateau, a repetition of fires in many places has bared the rock, and created veritable rock wastes. In the Northwest, it is estimated that not less than 50 per cent of the original growth of woodlands has been killed by fire. The humid slopes of the Pacific coast suffer less, but the dry Rocky mountain slopes are to a large extent burned over. Feeble beginnings to stop the fires are being made by the Dominion and Provincial governments. The former has a forestry bureau, which is beginning to bring better methods into the treatment of the timberlands, and distributes material for tree-planting on the prairies and plains. It has set aside 11,250 square miles of forest reservations of the provinces. Quebec has set aside nearly 15,300 square miles of forest reservations and has a bureau to devise plans of management. Ontario has 16,300 square miles of reservations, but no organized bureau for their management.

The National Economic Influences of Forests.

By *J. W. Toumey.*

The first of all our natural resources is the land; on the continuance of its fertility depends to a large measure the future prosperity of the nation. The farmer and the forester are the chief users of the land. The farmer is able to use only a comparatively small percentage of the total land surface for purposes of tillage. This is true not only of this country, but equally so of the older nations across the sea. In Great Britain, the farmer tills about one-third of the land, in France and Germany about one-half, and in Sweden about one-thirtieth. Even in densely populated India and China, probably less than one-fourth of the land is tilled. In all countries it is only on the more fertile lands that economic tillage is possible. Even on these lands, the farmer exhausts with more or less rapidity the soil fertility in the production of agricultural crops. Throughont the South, the East and the middle West, the necessity for the skilful rotation of crops and the increased use of fertilizers in order to maintain soil fertility becomes yearly more apparent.

Where climatic conditions are favorable, it is only rarely that the land is too sterile for the growth of forests. Furthermore, unlike agricultural crops, forest crops, as a rule, improve the fertility of the soil. In the older parts of the country, notably in New England and the southern states, many farms once tilled have gone back to forest, primarily because relatively poor land when first cleared of forest growth will produce agricultural crops. Soon, however, it becomes so exhausted that tillage no longer pays. In many parts of the country, notably in Michigan, Wisconsin and Minnesota, lands unfit for agriculture are being cleared for tillage at the present time. Under present economic conditions, these lands must soon be abandoned because of the rapid depletion of their fertility under cropping. National economy demands that they continue in forest, because the timber grows without depleting the lands of their natural fertility (Fig. 49). Moreover, when these lands are taken for agriculture it soon becomes necessary to abandon them. (Cf. article by Hilgard, page 128.)

Fig. 49. A grove of white pine, thinned and pruned.

A relatively large proportion of the mountain and hill lands of the country are either too sterile or too rough for successful cultivation but are well suited for the growth of timber. Of our total land area approximately twice as much is suitable for the growth of timber as for purposes of tillage. From the standpoint of national economy, it is equally important that the soils only fit for forest crops be not impoverished, as it is that the fertility of the agricultural lands be maintained.

Effect of forest vegetation on climate.

Extensive observations of an exact scientific character were undertaken in Europe in 1867 in order to determine the effect of forest vegetation on climate. Since then, many observations have been made with the same purpose.

As regards atmospheric temperature, the results up to the present indicate that the mean annual temperature is, approximately, for temperate regions 1° Fahr. lower in the forest than in the open, where records are taken five feet above the soil. The effect of the trees in lowering the temperature is, however, much more pronounced in summer than in winter, and is largely dependent on the character and density of the forest. The Prussian and Bavarian observations show that beech woods, with their dense foliage, may lower the maximum July temperature more than 8° Fahr. and pine woods about one-half as much, while both actually increase the minimum January temperature more than 2° Fahr. The forest is also considerably cooler during the day and warmer during the night than in the open. Thus, observations made in southern Germany show that the effect of the forest in summer is to increase the minimum night temperature by more than 2° Fahr. and lower the maximum day temperature by nearly 7½° Fahr.

Owing to these differences in temperature in the forest as compared with the open, the induced currents of air have more or less beneficial effect on all the adjacent country. There appears to be ample proof that the forests, through their effect in checking radiation, modify the extremes of atmospheric temperature. This is particularly true regarding daily extremes. Forests, therefore, make conditions in their vicinity more favorable for agriculture and for human abode.

The influence of the forest on soil temperature is also of considerable importance. This is particularly true of forests growing in closed canopy. The observations that have so far been made, particularly those made in Bavaria and Würtemberg, show clearly that the mean annual temperature of soil in a forest, to a depth at least four feet, is lower than that of soil in the open. The difference is much greater in summer than at other seasons, the annual average being, approximately, 3° Fahr. In summer, the average difference may exceed 7° Fahr. and the maximum difference 14° Fahr. The daily variation in soil temperature is very little except in the upper layers. In the forest, however, this daily variation is not nearly so great as in the open. The effect of the forest is, therefore, to lessen the daily extremes in soil temperature and to lower the temperature, particularly in spring and summer. Furthermore, the effect of the forest on soil temperature extends to some distance beyond its confines, because of its effect on atmospheric temperature.

There is a well-marked difference, particularly in summer, between the relative humidity of the air in forests as compared with the open, although there is no appreciable difference between the absolute humidity. Observations in Switzerland have shown the air in spruce woods in summer, at four feet above the ground, to be over 11 per cent nearer the point of saturation than air in the open. In the tree crowns, the difference is not nearly so great. In general, the mean annual relative humidity of forest air is from 3½ to 10 per cent greater than that of air in the open.

The general opinion is that forest vegetation very perceptibly increases the precipitation of aqueous vapor. Although many observations have been made, particularly in Europe, to determine, beyond doubt, the truth of this opinion, the results have been so variable and conflicting that we have as yet no satisfactory proof that forests play a very important part in increasing precipitation. The analysis of the observations made, up to the present, indicate that in mountainous regions large areas of forest may materially increase local precipitation. On the other hand, the forest has apparently but little effect in increasing precipitation at lower elevations.

Forests and water preservation and retention.

Many observations have been made during the past half century to determine, with some degree of accuracy, the relation of forests to water conservation. In this country, Newell, Pressey, Vermule and Rafter have given special attention to this subject. Investigations dealing with various features of the problem have been undertaken in Germany, France, Russia, Austria, Italy, Switzerland and India. Among the more recent European contributions are those of the National Forest School, at Nancy, France, which gives the results of thirty years of observations. The United States Forest Service has also given some attention to the investigation of this subject in southern California.

Precipitation after reaching the ground escapes in five ways, viz., by evaporation, transpiration, surface run-off, seepage run-off, and deep seepage. By evaporation is meant the moisture that passes into the atmosphere in the form of aqueous vapor from water and soil surfaces and from objects resting upon such surfaces, including vegetation. Transpiration is that portion of the rainfall that sinks into the soil and is later taken up by the vegetation through the roots and given off to the atmosphere through the foliage. To this should be added, although not technically a part of it, the comparatively small amount of moisture taken up by the vegetation, but which, through chemical change, becomes a part of the organic vegetable structure. By surface or superficial run-off is meant that portion of the precipitation which, from the time of its falling until its passage from a given drainage basin into the stream, does not enter the soil. Seepage run-off is that portion of the precipitation which sinks into the soil, but which later reappears on the surface at lower elevations and which, together with the surface run-off, passes from a given drainage area by way of the streams. Deep seepage is that part of the precipitation which sinks into the earth to such depths that it does not later reappear on the surface of a given drainage area.

The stream-flow of any region consists of surface run-off and seepage run-off. Although the amounts of these two factors in run-off cannot be separately determined, the total run-off can be measured with a fair degree of accuracy. The surface run-off is flood-water and of destructive significance, while the seepage run-off gives the streams their sustained flow and is of great constructive significance. It is plain, therefore, that any factor that decreases the surface run-off and, as a consequence, increases the seepage run-off, is of the utmost economic importance in the conservation and utilization of water.

The proportion of surface run-off to seepage run-off is determined by a large number of variable factors, of which the forest is one of the first importance. Furthermore, it is the only factor completely under the control of man. The more important of these factors are as follows: (*a*) The amount and character of the precipitation; (*b*) the character of the topography; (*c*) the character of the soil, subsoil, and underlying rocks, i. e., the the geological formation; (*d*) the character of the vegetation. These four factors in the main determine the proportion of the rainfall that will escape as flood-water. They also determine what proportion of the rainfall will be taken up by the soil and become the greatest of all influences in furthering vegetable growth and making habitable places on the earth.

The forest, with its wealth of foliage, prolongs very materially the length of time during which the precipitation reaches the soil. Thus, water will continue to drip from the foliage for an hour or more after a heavy rain. In extending the time, therefore, during which the precipitation reaches the ground the forest has a material influence in decreasing surface run-off. Forest soil absorbs water much more rapidly than soil of similar origin but bare of forest growth. The greater the amount of humus, leaf-mold and other litter, the more rapid is the absorption. In every forest in which the leaf-mold and other litter forms a thick covering over the mineral soil, there is practically no surface run-off, except on steep slopes and in places where the leaf-mold and other debris have been removed by fire or other causes (Fig. 50).

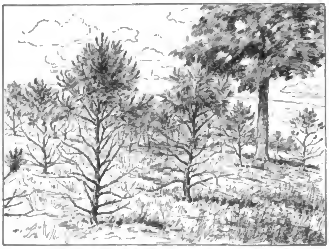

Fig. 50. Young pine trees nibbled by sheep. The leaf-cover is destroyed and the run-off increased.

The amount of precipitation absorbed depends, not only upon the rapidity of absorption, but also upon the length of time the precipitation remains where it falls or, in other words, upon the rapidity of the surface-flow. The longer the surface-flow is in reaching the streams, the greater will be the amount taken up by the soil. Now the rapidity of the surface-flow is determined primarily by two factors: (*a*) The topography of the region, i. e., the degree of slope down which the water flows; (*b*) the obstructions it meets in its course to the stream.

When rain falls upon barren soil, the moving water, by eroding channels, forms small rivulets, and then larger ones, that flow with a constantly increasing velocity. As a result, the water on the surface passes rapidly over the soil to the streams, and only a minimum amount gets into the soil. When the surface of the soil is covered with various obstructions, such as are offered by the forest with its vast accumulation of litter and vegetable growth, living and dead, the rainfall that is not immediately absorbed at the point of falling is checked by these obstructions in its flow over the surface. Consequently, there is more opportunity for it to get into the soil.

Forest cover, in preventing wind and water erosion at the sources of our mountain streams, produces a much greater effect upon the details of topography than is generally believed. The forest, acting through long periods of time, particularly in preventing the transportation of soil at the sources of mountain streams, causes a very different configuration on high forested mountains, as compared with non-forested ones. In mountainous regions, well-timbered ridges and summits are inclined to be broader and more rounded and better suited by their form to prevent rapid surface-flow of water. Hence, on well-wooded summits and ridges, because of differences in details of topography, resulting from the forest itself, a larger proportion of the rainfall is retained at high elevations, whence it gives, through seepage, permanent flow to mountain streams. On barren summits and ridges, on the other hand, because of this difference in topographic form, a much larger part of the rainfall rushes rapidly over the surface to lower levels.

The actual amount of water that gets into the soil, particularly at periods of excessive precipitation, is, however, not so much determined by the rapidity of absorption and the slowness of the surface-flow, as it is by the depth of soil and soil-cover capable of retaining it.

Everywhere over the surface of the earth, the soil, subsoil, and underlying sands, gravels, and the like, of plains and valleys are of great depth.

Except in glacial regions, they have been brought to the valleys and plains from the mountains through the action of wind and water erosion. In mountainous regions, therefore, the amount of soil and other materials overlying the solid rock foundation has usually been much reduced; in other words, the medium for absorbing moisture and retaining it, in such regions, has become limited. When the absorbing capacity is reached all subsequent rainfall must necessarily flow from the mountains as flood-water.

The forest has a great influence on the amount of the absorbing medium in mountainous regions, chiefly for the following three reasons:

(1) Because of the very large amount of decaying organic matter it provides and the absorptive capacity of moss and other plant forms that occur in the forest.

(2) Because of the much greater depth of mineral soil in the forest resulting from the influence that the latter has in reducing wind and water erosion.

(3) Because of the more broken condition of the underlying rocks through the action of deep-rooted plants, more particularly of forest trees. Such plants send down their roots into narrow rock fissures, by their growth widen the fissures, and by their death leave numerous openings into which the water can freely pass.

Whether forest vegetation increases or decreases, the total annual stream-flow depends very largely on the character and distribution of the precipitation through the year and also on the general topography of the region. Rafter's observations appear to point to the conclusion that in regions that are not decidedly precipitous, and where the precipitation is fairly evenly distributed over the year, forests materially increase the annual run-off. On the other hand, my own observations in southern California indicate that in mountainous regions having a rainy season of large precipitation followed by a long dry one, the effect of the forest cover is to lessen materially the total annual run-off. Although a non-forested area may, in certain instances, produce a larger run-off than a forested one, this probably never occurs except when the run-off from the non-forested area is largely flood water and of destructive rather than of constructive significance.

The economic development of our rivers and smaller streams for purposes of irrigation, water power and city water-supply has scarcely begun in this country. The present century will witness rapid advance in the development of these great natural resources. Their economic importance, however, will not depend so much upon the annual discharge as upon the regularity of the flow.

The national government, by erecting large and costly reservoirs in many of the arid and semi-arid regions of the West, is holding back the flood waters of the rainy season in order to maintain the stream flow during the dry season. Reservoirs, however, are not wholly effective without forests. When the water is gathered from a denudated drainage basin, surface erosion so completely fills the reservoir with sediment that in time it is rendered useless.

The fuller utilization of our surface waters, particularly our rivers and streams, and their future importance to the country, demands that forests be maintained at the sources of all our important water courses, not only in the arid regions of the West, but in our eastern mountains as well.

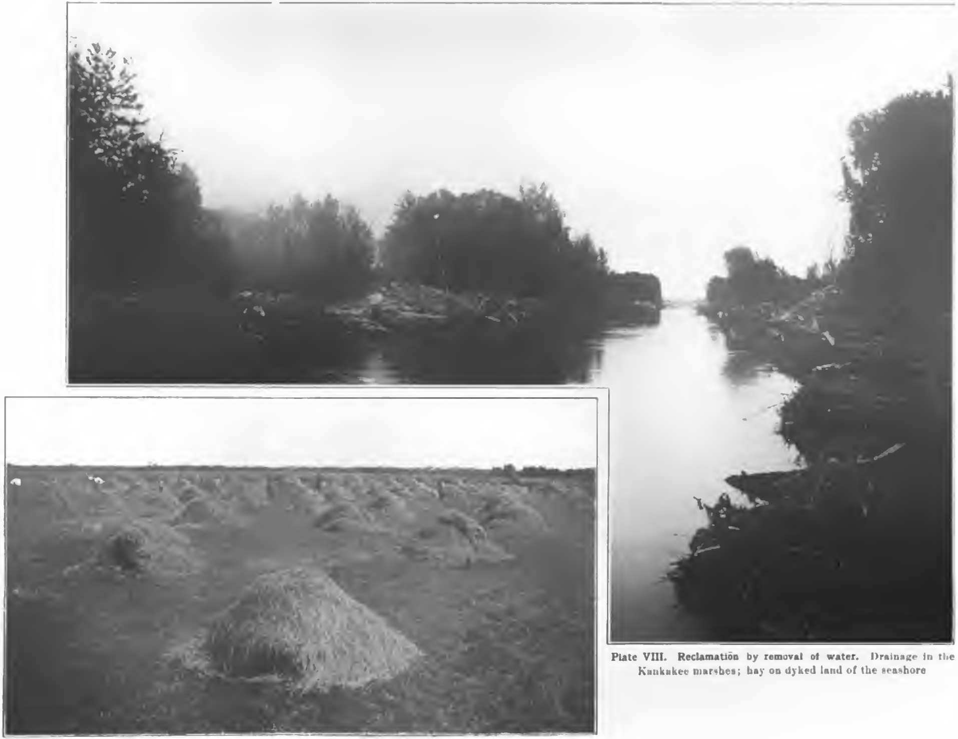

Plate VIII. Reclamation by removal of water. Drainage in the Kankakee marshes; hay on dyked land of the seashore

Relation of Forests to Public Health.

By *W. W. Ashe.*

Forests, by supplying certain material needs, lumber, fuel, turpentine, and the like, thus administering to human well-being, have a direct and evident influence on general health. In addition to this too evident relationship, the forests exert subtle and indirect influences scarcely less important in their ultimate sanitary effects. Some of these influences are general in character, while the hygiene of others is restricted to regions that are limited or in which certain conditions exist.

The sanitary utility of forests depends largely on their influence on rainfall, on stream-flow and on climate, factors that are intimately correlated. The scientific facts upon which this relationship depends pertain chiefly to the influence of forests on the amount and character of the precipitation, and on the amount, the distribution and the character of that portion of the rainfall which runs off in the streams.

Benefits coming from forests.

The chief sanitary benefits appertain to (1) the amount and purity of domestic water-supply, (2) the lessening or prevention of river floods and the diseases that follow them, (3) the tonic value of forests in connection with parking systems, (4) the location of camps for tuberculous patients, (5) the use of windbreaks to protect homesteads.

Domestic water-supply.—Forest-protected watersheds offer a steady supply, there being a high flow during the summer, which necessitates less storage when the demands upon the water service are at a maximum and when the sanitary needs are greatest. This is of great value when the supply of water is limited or the storage facilities are small. Waters from forest sources are of a low initial turbidity and require less sedimentation or a low cost of filtration to obtain a clearness of a given standard. The bacteriological purity of the water is likewise higher, and with a reduced number of pathogenic germs there is a corresponding decrease of zymotic diseases, especially of typhoid fever. On account of the general use by the cities on the coast of the water of the larger rivers for domestic supplies, the sanitation of our waterways has become a most important problem.

It is desirable that cities and towns at the headwaters of the streams make use of primarily pure sources from forest-protected basins. The elimination by this means of water-borne diseases from those towns will tend to reduce the outbreaks in cities that are below them on the rivers and which use the sewage-contaminated water for municipal supplies. Until recently, Wilkinsburg, Pa., used the water of the Allegheny River tainted by the sewage of more than twenty towns. It is not strange that sympathetic epidemics of typhoid fever should have succeeded outbreaks in the towns above it. Many cities, chiefly in the West, draw their supply from forested watersheds: Portland, Ore., Ashland, Ore., Boulder, Durango, Butte, Bozeman, Helena, Pasadena, Waynesboro, Pa., Asheville and hundreds of smaller towns. A forest-protected system is particularly suited to factory towns in and near the mountains, which would otherwise probably be dependent upon wells subject to surface contamination. Forests protecting such watersheds need not be inert capital, but can become, if wisely administered, yielding investments. The ownership of such watersheds offers one of the broadest and most serviceable fields for state and municipal forests. Forested watersheds yield a water of high initial purity, but, if the water is open to accidental surface contamination, its purity should be safeguarded by filtration or sedimentation. This should produce a water of the highest possible purity.

Lessening of floods.—The forest is the chief amenable factor in controlling stream-flow, especially in those regions where forest influences are high, as in the southern and southwestern states. The inundation by floods of farm lands and dwellings and of river towns, particularly the large ones on the Ohio and Mississippi rivers, is accompanied in every instance in the districts affected by general sickness, chiefly by fevers and malaria. The gradual reduction in the influence of the forest, as the land has been cleared for farms and the forest lumbered or burned, and as the destruction of the humus in the remaining forest has taken place, has greatly increased the number and height of floods on nearly all of the important rivers. The restoration of normal humus and soil conditions in the permanent forest lands of such river basins, and the reforesting of cleared lands subject to excessive erosion, has invariably a beneficial influence in lessening the height of floods, and is the first and most essential step towards flood control. In addition, storage reservoirs such as are being used on the Kennebec river and on the upper portion of the Mississippi river, are often necessary to compensate for the high run-off from the area that has been cleared for farms. It is necessary to protect, by forests, the watersheds of the streams impounded by such a system of storage reservoirs, in order to prevent the silting up of the reservoirs and the consequent loss of their storage capacity. The control of floods is an important sanitary as well as economic problem on the Ohio river, the lower portion of the Mississippi river, and on many of the larger streams of the southern and southwestern states.

Forest parks.—The use of municipal forests and similar reservations as places of recreation and recuperation has an important hygienic bearing on congested urban population. It cannot be claimed that the tonic of forest air and surroundings is more beneficial than that of sea air or than that of the mountains; but while these latter are accessible to only a few favorably situated cities, the forest can be made accessible to all. It is possible through the sale of its timber largely to defray the cost of its maintenance without in the least interfering with its sanitary function. Such forests also enable cities during periods of business depression to use profitably a considerable number of unskilled laborers who would otherwise suffer. On the restoration of normal economic conditions such labor can be returned to its former line of usefulness without interfering with the management of the forest.

Consumption camps. — Several states, notably Pennsylvania, have established consumption camps in forest reservations. The equableness of the forest climate, especially the tempered daily changes, the freedom of the air from pathogenic bacteria and from irritating dust are favorable curative conditions. In addition to this, a certain therapeutic value has always been assigned to coniferous forests and such camps are usually situated among cone-bearing trees. On account, however, of the heavy shade and the high humidity in the forest, buildings in such camps should be located on the northern edge of small clearings to secure all possible sunlight (Fig. 51). The isolation of tuberculous patients, and the rapid destruction of sputa on forest soils lessens the opportunity of transmission of the disease to healthy persons.

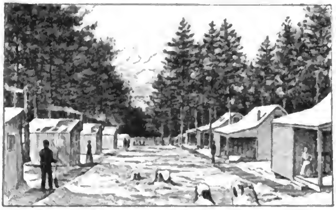

Fig. 51. A health camp in the Appalachian forest.

Windbreaks and shelterbelts of trees are generally used in many parts of the North and Northwest,—especially on the plains,—to protect dwellings from winter winds. In those sections where winds are severe they are found to be of very great benefit.

Communal Forests.

By *Raphael Zon.*

An institution of the highest economic significance in Europe, and one that has reached its fullest development in Switzerland and Germany, is the ownership of forests by city and village communities. The origin of these communal forests loses itself in the earliest history of the European countries.

Origin of European communal forests.

In Germany, most of the communal forests are nothing but the remnant of the ancient mark, a communistic organization, the members of which, outside of house or garden, owned in common the rest of the territory. The forests known as the "Marca" or "Grenzwald" were communal property, and actually remained such until the thirteenth century; and, in spite of the many economic and political vicissitudes and changes that the original mark has undergone, before assuming the form of the modern community, this common ownership of the forest is still retained in many communities.

The origin of the city forests dates back to the tenth century, when towns were built with walls and towers for defense against the Huns. Settlement in these towns was encouraged in every way, by gifts of land, including large forest areas, by granting freedom to serfs who moved to the towns, and by stimulating industries of all kinds. The cities became rich, powerful, and free republics. They played an important part in the struggle of the kings to subdue the nobility by helping the kings with money and arms. The kings, in order to obtain loans, often mortgaged forest properties to the towns, and failed to redeem them. A great many city forests owe their origin to this practice, and to a smaller degree, to purchase.

In France, communal forests take their origin, in many cases, in the mark, just as in Germany. In other cases, communal ownership of forests owes its origin to colonization by the seigneurs of their domains with serfs and others, to whom they gave charters for villages with communal privileges and rights.

A large proportion, however, of communal forests in France is due to the decree of 1793, by which municipal corporations were given presumptive ownership to all land to which the claimant could not show a deed of purchase. Since most of the owners of large estates in France came into possession of their property through their feudal relations and had, therefore, no deed of purchase, such property fell to the municipalities. This law was later repealed, and much of the property returned to the original owners, yet the communal forest area was in this way increased to 5,000,000 acres, or 23 per cent of the total forest area.

In Switzerland, the communal forests are also the remnant of the mark, but since feudalism was not developed to the same extent as in Germany and France, and serfdom was abolished at a much earlier date, the rights of the members of the community underwent fewer restrictions and have been preserved much more in their original form. The result is that 67 per cent of the total forest area is owned by communes.

The development of communal forests in other European countries can also be traced back to the mark, though other influences have played a more or less important part. In Sweden, for instance, most of the communal forests have originated as grants from the crown. In other cases, as in a number of German states, some communities were given full title to definite forest areas by the states, in exchange for the relinquishment of certain rights of user in the state forests.

Thus, the origin of the European communal forests can be traced to a number of causes. Some have evolved from the ancient Teutonic mark;

some have come through the failure of the kings to redeem mortgages on their forest properties given to the cities in exchange for help in their struggle against the barons; some through grants given especially at the time of the founding of towns or market-places; and still others through relinquishment of rights of user on state forests, through purchase and through the planting of barren land belonging to communities.

A study of the extent and distribution of communal forests in Europe, the methods by which they are administered, the revenue derived from them, and their general effect upon the community, fully reveals their importance in the economic life of city and village communities.

Distribution and extent of communal forests.

In Switzerland, of the 2,000,000 acres of forest land, 67 per cent or nearly 1,350,000 acres are communal property, and this area is being constantly increased through purchase of private holdings. In Italy, the communal forests form 43.3 per cent of the total forest area. In France, the communal forests occupy 23 per cent or 5,000,000 acres, which are not, however, evenly distributed. Out of 35,989 communities only 11,479 or 32 per cent own forests. In Austria, out of 23,000,000 acres of forest land, 14 per cent or 3,120,000 acres belong to communities.

In Germany, 15.2 per cent of the total forest area or 5,600,000 acres are communal property. If, however, there be added to this the corporation forests which are administered under the communal forest laws, the total area will not be less than 19 per cent. Of all the German states, Hohenzollern, with over 50 per cent of the total wooded area in communal forests, ranks first. Baden, Alsace-Lorraine, Hesse-Nassau, Rhineland, have between 40 and 50 per cent, the Grand Duchy of Hesse, Sachse-Meiningen, Würtemberg, between 30 and 40 per cent, Waldeck, Hanover, Oldenburg, from 10 to 20 per cent, the other provinces less than 10 per cent.

The following figures give an idea of the size of the various forests owned by city and village communities in two German states:

Communal Forests of Bavaria and Baden.

Acres	2½ to 125	125 to 250	250 to 1,250	1,250 to 2,500	2,500 to 5,000	5,000 to 8,000	8,000 to 15,000	Over 15,000
States.—Number of towns in								
Bavaria	2,488	531	1,200	302	132	43	10	8
Baden	396	255	611	68	16			

In Alsace-Lorraine, out of 1,698 towns, 1,111 or 65½ per cent own forests; 111 have a share in the forests of other communities, and four in state forests. The size of the individual communal forests varies between 4½ and 6,650 acres and averages 435 acres.

In Prussia, the size of the communal forests will average about two thousand acres. This is probably the highest average for all Germany. But even here few of them are sufficiently large to form an independent unit of management and occupy the entire time of one forester.

Administration.

There is little doubt that the reason why the communal forests in Germany and throughout the rest of Europe are in such a high state of development is due to the strong control the state exercises in the management of the common property of town and village communities. This state supervision over communal property had its origin in the ancient relations that existed between the communities and their seigneurs, or liege lords. With the passing of feudalism this right of supervision over the communal property rested first with the kings or dukes and later with the state authorities in general. This, at first glance annoying, interference of state authority in the internal affairs of city and village communities and the curtailment of their rights of ownership has, however, proved beneficial and has added to their prosperity. The villages in certain parts of Germany which on account of slack state supervision sold their forests in 1848 almost invariably became impoverished, while those that were not allowed to dispose of their forests are now receiving from them a revenue that frequently pays all the taxes of the community, and in addition helps materially in lessening pauperism, in increasing credit, and thus enabling large enterprises to be undertaken.

Fig. 52. Silver fir in the Sihlwald, the city forest of Zürich.

The state supervision of communal forests varies in different localities and even within the same state, and may be of three degrees:

(1) The state merely restricts the clearing or selling of communal forests. In order to sell or clear their forests, the communities must secure permission from the state authorities, a permission, however, which is not readily granted unless it can be proven that there is too much forest land and that part of it could be used for agriculture, or unless the request is supported by some other good reason. In all other respects, the communal authorities are left free to manage their forests as they please. This is the lightest form of state supervision and the one that has been least successful in securing proper management for the communal forests. This system of supervision, which is found in the provinces of Rhineland and Westphalia, is rather limited, extending over only 4 per cent of the communal forests, or 240,000 acres.

(2) The state not only prevents the clearing off or disposal of the forests, but actually supervises the technical management. It requires that the forest should be managed in accordance with a definite plan approved by the state authorities. It determines the amount and character of the cutting to be done every year, the area to be planted, and other cultural operations, such as thinning, weeding, and the like. It demands as one of the conditions that the work should be done by recognized foresters. It leaves, however, the appointment of the forest officers to the discretion of the town authorities.

The community may do one of four things: (*a*) It may employ its own forester,—this, however, is seldom done because the small size of the forest does not justify the employment of a technically trained forester; (*b*) it may unite with several other communities and employ a forester to manage their combined forests. This is frequently done, but in practice it has many serious disadvantages. The communities for the sake of economy often burden one forester with too large a forest area scattered over a wide district, with numerous and often contradictory interests, that make management and administration difficult and non-productive of good results; (*c*) it may secure the services of the nearest state forester to look after the communal forest and give the state compensation for his services; (*d*) it may give over the entire management of the communal forests to the state. In this case, the state includes the communal forest in one of its forest districts, treats it as a part of the state forest, and charges the community for its management.

This system of technical supervision by the state through forest officers appointed by the communities or directly through state foresters is extended to nearly 50 per cent of all communal forests in Germany, and is generally effective in bringing about their proper care and management.

(3) The state, without asking any consent or leaving any option to the communal authorities takes over the entire charge of the communal forest, and administers it as if it were actually the property of the state. The community compensates the state for the cost of administration and gets all the revenues. This is the strictest form of state supervision, the most efficient, and the cheapest for the communities, although it involves the greatest curtailment of their rights of ownership. This system of supervision differs little in practice from the previous system in which the community turns over its forest to the care of the state, except that in the first case the communities are given an option, and in the second case they are not. This system of state supervision is very common throughout the German empire, and covers 46 per cent of all the communal forests.

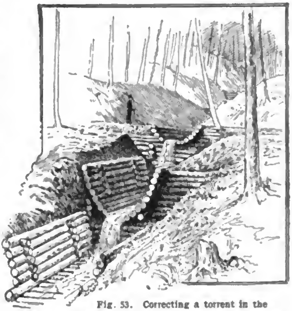

Fig. 53. Correcting a torrent in the Sihlwald. The German method of preventing erosion

In Switzerland, France, Austria, and Hungary, the same strict technical supervision by the state exists, with some slight modifications.

Yield.

In Germany, communal forests, as compared with state forests, produce less wood per acre per year. There are several reasons for this. Most of the communal forests, with the exception of those owned by the richest and largest communities, were in very poor condition as late as the first third of the nineteenth century, and began to show improvement only with the stricter execution of the forest laws under state supervision. The bulk of the communal forests (51 per cent) are composed of the slower-growing broad-leaved trees, and are commonly sprout forests or mixed forests of sprout and seedling growth. Such forests as a rule yield inferior wood. Thus 29 per cent of the yield from the communal forests is wood below three inches in diameter (faggots and stump wood), while in the state forests only 17 per cent of the yield is of this class. On the other hand, the communal forests yield only 31 per cent of saw timber, as against the 48 per cent from the state forests. Including all classes of wood, the total yield per acre per year in communal forests is nearly fifty-four cubic feet and in the state forests over fifty-nine cubic feet.

The following figures for the different states of the German empire show the yield per acre per year in state, communal, and private forests, of wood over three inches in diameter and not including faggots and stump wood:

Yield of Forests According to Ownership in the Several States of Germany for 1900.

States	State forests		Communal forests		Private forests	
	Yield per acre cubic feet	Per cent of saw timber	Yield per acre cubic feet	Per cent of saw timber	Yield per acre cubic feet	Per cent of saw timber
Prussia	41.7	58.9	27.7	43.3	25.4	52.4
Bavaria	55.5	53.0	38.4	43.2	42.2	55.3
Saxony	68.2	80.7	41.7	70.8	35.4	60.6
Würtemberg	71.0	56.8	48.1	50.6	43.6	32.3
Baden	73.7	47.6	59.0	44.1	48.6	54.3
Alsace-Lorraine	53.8	55.8	51.1	40.9	51.1	40.6
Average for Germany . .	48.6	57.1	37.7	43.8	31.1	53.1

Thus, as regards the yield in wood, the communal forests occupy an intermediate position between state and private forests. Of the different states, Baden and Saxony lead in the production of timber for all classes of owners.

In France, however, where the average annual yield per acre is less than in Germany, the communal forests produce annually thirty-six cubic feet per acre, which is a trifle more than the yield for state forests. The cut from communal forests is about 18 per cent of the total cut of timber in France. The yield per acre for the communal forests of other countries differs but little from that of Germany or France.

Financial returns from communal forests.

While there are some detailed figures in regard to the financial returns from a few individual communal forests, the statistics available give only a general idea of the revenue brought in by such forests. The following table gives a comparison of the gross annual income, expenditure, and net income per acre for several Swiss town forests. The wide variation in the results is due to the fact that the forests are of different composition. Those that show the highest net returns are coniferous forests, while the lower returns are from hardwood forests:

	Gross income	Expenditures per acre	Net income
Town forest of Winterhur .	$15 76	$5 36	$10 40
Town forest of Zofing . . .	11 60	2 96	8 64
Town forest of Zürich . . .	24 56	16 88	7 68
Town forest of Murten . .	12 48	3 44	9 04

These figures are probably above the average. But, even taking the average price for all classes of wood as six cents per cubic foot, as it was in Prussia in 1903, and figuring the average total annual yield per acre for communal forests at 54 cubic feet, the annual gross income per acre from the sale of wood alone, and not counting the revenues from hunting privileges, pasture, and other sources, is $3.25. If we remember that the average size of a town forest in Prussia is about 2,000 acres, and, therefore, the annual gross revenue from it is $6,500, it is not surprising to find communities that derive from these forests a revenue sufficient not only to pay all the taxes corresponding to our county, town, and school taxes, but to yield, in addition, to every householder an annual dividend.

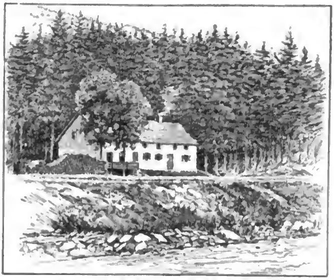

Fig. 54. Workmen's house in the Sihlwald.

Thus, the town of Zürich for the last ten years received on an average an annual net income of $20,000 from its 2,500 acres of actual forest land. The city of Freiburg derives an annual income of between $20,000 and $30,000 per year from its 8,000 acres of forest.

The 5,600,000 acres of communal forests in Germany yield annually about 304,000,000 cubic feet of wood, which, at an average price of six cents per cubic foot, brings in a gross revenue of nearly $18,500,000. Allowing even half of this for the administration of the communal forests, there remains a continuous annual net income of $9,250,000. This capitalized even at 3 per cent represents a property worth $308,000,000. This fact may help to explain why even the little towns in Germany are so far in advance of American towns in the matter of municipal improvements.

The revenues from the communal forests in other countries, while not so great as in Germany, yet play a most important part in the finances of the city and village.

As regards the division of revenues, all communal forests fall into two classes:

(1) Forests that are the property of the town or village community as a whole; (2) forests that are the common property of the individual members of the community.

In the first case, the revenues from the forests flow directly into the treasury of the town or village, and are used for public purposes and improvements. In the second case, the revenue or the product of the forests is actually divided among the individual members of the community. Commonly, however, the two methods of dividing the revenue are combined. Sometimes, when there is a surplus in the treasury and no important municipal improvement, such as the erection of a public building, is contemplated, this surplus is divided among the members of the community either in the form of dividends or of product. Sometimes, after the members of the community have received their dividends or their share of firewood, a part of the income is put in a fund to be used for schools, roads, churches and other institutions.

Possibilities for municipal forest ownership in the United States.

The growth of the municipal forests of Europe is most intimately connected with its political and economic development. It does not follow, however, that a country must have the same history in order to have communal forests. If the communal forests were not beneficial institutions, they would undoubtedly have died out and passed away like other institutions that have outlived their usefulness. The old form simply proved to be adapted to the new economic requirements of cities and villages, and has, therefore, been preserved and developed.

In this country, where the development of cities and villages followed an altogether different course, there were present none of the factors to which European communal forests owe their origin. Yet, with the growth of our cities, which, as compared with European cities, are extremely young, and are deficient in many municipal improvements, with the gradual betterment of our municipal government, there will come a time when municipal forests here, as well as abroad, will be considered one of the best investments that a city or village community can make. It will prove here, as it has proved abroad, a most efficient means of improving the health of the people through the protection of its water-supply. It will provide work for the unemployed and, properly managed, will yield a regular and continuous revenue that will lessen the burden of taxation and give more stability to the finances of the city or village community.

Besides these financial advantages, the communal forests in Europe exercise—and there is no reason why they should not exercise also in this country—a most beneficial moral influence on the members of communities, by creating in them a feeling of local attachment, and by adding fresh charm to rural life. Most communal forests serve as great parks, as for instance, the famous town forest of Carlsbad, in which the beauty of the landscape is preserved unharmed, and a network of well-kept roads and trails with occasional benches along them is maintained. The fact that most of the communal forests are at the same time a recreation ground does not detract in the least from their primary object of producing revenue, just as the Adirondack mountains, for instance, support a great many industries depending upon wood, and are at the same time a great pleasure and health resort.

The ways in which American communities can come into possession of forests is through purchase or through gifts by individuals. Some American cities are now beginning to realize the importance of forests as a protection to their water-supply, and are buying up or planting land for this purpose. City parks must not be confused with municipal forests. The latter are forest areas managed just as any other forest, with the idea of growing timber for revenue, and at the same time protecting the water-supply, while the former, here as well as abroad, are maintained often at great expense purely for esthetic and hygienic purposes.

State Forest Policy.

By *Herman Haupt Chapman.*

As the virgin timber supplies in the different states near the point of exhaustion, the question of growing timber to meet the many urgent needs of our industries and arts is brought squarely before the public. The national government has been able, by timely legislation and the courageous action of several of our Presidents, to retain title to an immense area of public timber-lands lying west of the Mississippi river. But constitutional limitations will probably confine the operations of the Government to public lands, or to tracts situated at the headwaters of rivers that form inter-state waterways. In the eastern states especially, state governments have duties and responsibilities in forestry that can never be assumed successfully by the national government.

Private forestry.

The first of these duties is the encouragement of private forestry. No matter how much land the state may finally acquire, much the larger and more valuable portion of the timber-lands capable of producing the most rapid growth of timber will remain the property of private owners as woodlots, or of large land owners or corporations as cut-over lands. On these lands, the production of new crops of timber must depend upon private effort.

But, left to themselves, private owners will be slow to undertake forestry on a large scale (Fig. 55). The extensive growing of timber can be carried on by individuals only as an investment that must give them a return on their money. Under present conditions, the danger of destruction or severe damage to timber by forest fires is so great that such investments are not safe, and the comparatively long period the investor has to wait, with his property exposed all the time to fires, before he can realize any returns, will discourage many who otherwise would grow timber. A second, equally serious, drawback is the heavy taxes that in many localities are assessed against standing timber and which threaten to absorb whatever profit might otherwise be made by the owner. It is clearly the duty of state governments to remove these two great obstacles to private forestry by passing and enforcing suitable laws.

Fig. 55. Grove of black walnut, about thirty-one years old. An example of a private forest reserve.

Fire protection.

Most states have already passed fire laws making it an offense to set fire to woodlands either purposely or accidentally. Such laws have always remained a dead letter until the office of fire-warden was created for the proper enforcement of the law. The most primitive form of a fire-warden system is that which imposes the duties of fire-warden for a town upon the town supervisors. Experience has shown that such officials are indifferent to these added duties. The best results have been obtained in states that have created the office of state fire-warden, and made the local or town wardens appointive. The town board may retain the power of appointing a fire-warden, or he may be appointed by the state warden, who should in any case approve the appointments and have the power to remove an inefficient man. By this plan a warden may be secured who is willing to devote the proper time to his duties, and who can be retained in office by reappointment as long as he is willing to serve. With an active and efficient state fire-warden to supervise the work of the town wardens, instruct them in their duties, and weed out incompetent wardens, a sound basis is laid for fire protection of woodlands.

But no force of fire-wardens, however good, can prevent fires if neither the owners of forest lands nor the residents of the locality desire protection. If fires are constantly being set and the warden's duty is merely to extinguish them, the expense would be prohibitive. Prevention of fire is the cheapest method, and this can be accomplished by education of the public to the damage done by small as well as large fires, by punishment of offenders, and, when possible, by providing for patrol, during the dry times, by the wardens or deputies. Large owners can supplement the work of town wardens by using their employees as a fire patrol, and state laws should provide for the appointment of such persons as fire-wardens.

The progress already made in some states under proper laws is such as to encourage the belief that complete fire protection may, in time, be secured wherever an honest effort is made along the right lines. The expense of fire protection should be shared by the state and the local government, either town or county. Towns that need fire protection most are often least able to afford it; the production of timber concerns the state as much as the town. The state warden will have greater influence if part of the expense is borne by the state.

Tax reform.

In the matter of tax reform for the encouragement of private forestry, little progress has been made. Many laws have been passed providing for some form of bounty, rebate, or exemption on plantations of timber trees. Some have been declared unconstitutional, while others have not been taken advantage of. A more general reform is needed. As long as timber is looked upon as real estate, it will be overtaxed. Virgin timber which has cost the owner no effort to produce, may, with some reason be assessed on the basis of realty, but, when woods are grown as a result of definite outlay of time or money, they are in all respects a crop, and represent income on the land. The effect of the present system of taxation is to force the owners of valuable timber to cut and market it to escape extortionate taxes, and to discourage the growing of new crops of timber trees. It is not possible to cut and market timber until it reaches certain sizes, and, the longer it is allowed to grow, the more valuable the product becomes to the community.

Standing timber should be released from taxation whenever it can be shown that the property is being managed for the continuous production of wood crops. The best method of accomplishing this is to limit the assessed valuation of such lands to the value of similar wild or unimproved lands not timbered, and provide that the lands shall be managed under plans approved by the state forestry officials. Should the discrimination in favor of forest lands cause too great a loss of revenue, a tax should be laid on the timber when it is cut rather than on the standing timber. Tax reform for woodlands may be expected soonest in states whose supply of virgin timber is nearest to exhaustion.

State forest policies.

The forest policy of any state would be incomplete if confined to such general legislation to encourage private forestry. There is much to be learned in this country regarding methods of handling woods to get the best growth of most valuable timber. Mistakes are costly, for they do not become fully apparent for many years. The state should provide against such mistakes and wasted effort on the part of its citizens, first, by employing a forester with a thorough professional education and considerable experience to give information to those in need of it; and second, by acquiring land as forest reserves for the purpose of experimenting and demonstrating the best methods of forest management. Such a policy is illustrated by the work of the agricultural experiment stations. There is no state so small or with so little waste land that it would not be justified in establishing small forest reserves for educational purposes (Fig. 56). But most states ought not to stop with these. In nearly every large state there are bodies of land that are not suitable for agriculture and which, for many reasons, the state should own and manage as forest reserves.

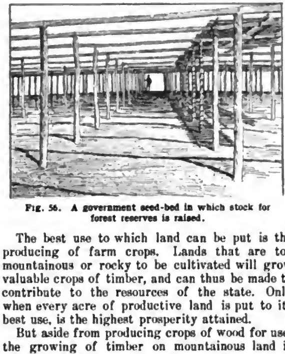

Fig. 56. A government seed-bed in which stock for forest reserves is raised.

The best use to which land can be put is the producing of farm crops. Lands that are too mountainous or rocky to be cultivated will grow valuable crops of timber, and can thus be made to contribute to the resources of the state. Only when every acre of productive land is put to its best use, is the highest prosperity attained.

But aside from producing crops of wood for use, the growing of timber on mountainous land is desirable for two other purposes. The first of these is the preservation of the soil on steep slopes by preventing erosion, and the consequent regulation of the flow of streams and the reduction of danger from floods. This is one of the most striking and most easily demonstrated effects of forests, and in certain mountain regions is the chief argument for forest preservation.

The second motive for devoting mountain lands to timber growth is to furnish parks and pleasure grounds for the public. This last incentive is the simplest and most widely understood of the three, and will meet with the most ready support. It has, however, often been unduly emphasized. A state forest policy that is unable to harmonize these three essential objects of forest reserves, namely, timber production and use, protection of soil and water, and public parks, will remain a continual source of dissension in the state and is economically false.

Timber should not be cut indiscriminately when the other two objects must be secured. It is, however, an inexcusable waste to prohibit the cutting of timber upon large areas of forest land in order that they may be used exclusively as parks. The great majority of persons visiting such forests will travel along certain definite routes, either streams, or trails, or roads. The old timber can be left intact in all such places. For landscape effects from the tops of mountains, young timber looks as well as older growth, and it is only necessary to keep out fire, and protect the soil from too heavy cuttings. Thus, the management of large state holdings as parks is not opposed to their use for the production of crops of timber.

When erosion is rapid and its effects on the flow of streams disastrous, state ownership of such lands and control of cutting is the only means, except national intervention for the same purpose, to end the trouble. Laws are sometimes proposed to prohibit timber owners from cutting trees below a certain size. Such legislation would be justified only in these mountainous localities, and then only when it could clearly be shown that the destruction of the property belonging to others would be caused by the removal of such timber. Such a method of attempted regulation of private property is far more drastic and difficult to enforce than a policy of acquiring the lands for the state. Public ownership makes possible any form of management best suited to the general good.

So great has been the pressure for state ownership of such mountainous areas that in the states of New York and Pennsylvania a total of considerably over two million acres has been acquired, largely by purchase, for forest reserves.

But some states have a much more difficult problem to solve than had either of those two states. There are many areas of level land that can easily be cultivated, but have not been successfully farmed. The commonest type, found in many pine regions, is a coarse deep sand with no subsoil. Much of this sandy land in older states has been taken up and abandoned several times. It is in dealing with soils of this character that a state policy needs strengthening. Conditions in America are still unsettled, and the pressure for land is very strong. The doctrine that lands too poor for agriculture should be used for the production of wood-crops (Figs. 424–428, Vol. II) has not yet been accepted, for no land that can be plowed will be relinquished without a struggle for use as forest reserves. In every state that has attempted to create forest reserves on sandy land, a bitter fight has been waged against the withdrawal of such lands from agriculture.

This opposition springs naturally from both the settlers in such districts and the speculators in farm lands. The interests of the settler are promoted by more rapid settlement, since a denser population not only reduces the taxes for roads and other improvements, but also creates better markets for produce. A suggestion that a portion of any region is unfit for agriculture is a blow at the development of the district. This should be recognized, and extreme statements and radical measures avoided by forestry advocates.

But final judgment cannot be formed without considering the other side as represented by the land speculator. In many districts, the test of experience has shown the difficulty of profitable farming, and the original settlers have abandoned the attempt. Land speculators find in these lands a fruitful source of profit, and induce inexperienced or overconfident investers to buy them for homes.

There seems to be but one way to meet this situation honestly, and that is by acquiring such lands for state forest reserves. These lands are needed for growing timber. In such thickly settled countries as Prussia, sandy lands are being purchased every year by the government and planted to pine. We must learn in this country to put land to its best use, and be willing to admit that in some cases this best use is forest production (Fig. 57). The ability to distinguish between agricultural and forest soils, and the power to open the first class to settlers and prevent the improper use of the true forest soils for agriculture, can be developed only in a state under a progressive policy of state forest reserves.

There are thus strong reasons for state ownership of forest lands in all instances in addition to the need of producing timber. Should the argument be based solely on the necessity for the state to grow timber, it might be held that a state must not compete with individuals in the production of crops. This is true when individuals can supply the demand for the product and when state competition would in any way hamper private effort. In the production of timber, however, experience in this country, as well as abroad, is rapidly proving that the individual or corporation is seldom willing to invest the money or to make the sacrifices necessary to secure a second crop of timber, while, under state control, the proper steps may be taken with little difficulty. It is certain that all the timber that can be raised by the united efforts of states and private parties will not supply the demand, hence it is equally certain that the growing of timber by the state will not injure the individual. It will aid such private efforts by improving public sentiment, by securing better fire protection, and by developing markets for home-grown timber. The larger and more valuable sizes of timber needed for special purposes, and the clear lumber that comes only from older trees, can be produced in the future only by the state, since no other owner can afford to wait so long before cutting his crop.

State forestry organization.—A progressive forest policy for a state calls for absolute freedom from political connections and for direction by men with proper training in and knowledge of forestry. A policy of land acquisition may be managed successfully by men without a forester's training; such public spirited men have been responsible for nearly all the progrees that has so far been made in securing state forest reserves. As soon, however, as the foundations are laid and the work of management for the purpose of timber production begins, it should be in the hands of trained foresters. In the long run, well-trained men will be found to be the cheapest and safest managers.

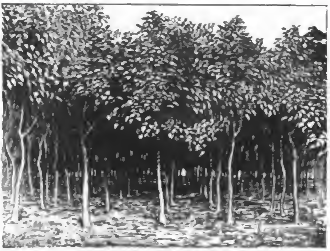

Fig. 57. A grove of young catalpa trees grown for commercial purposes.

The experiences of certain states have indicated the best method for securing an efficient and non-political management of forest reserves. A forestry board should have control of the policy of the state and should decide matters dealing with state lands and the expenditure of money. This board should be composed of men occupying positions of responsibility in the state, in educational or technical lines, and, when feasible, the commission should be named specifically, as, for instance, President of State University, Director of State Geological Survey, Professor of Forestry in some well-known institution. Five members would be the right number for the board.

The executive officer of the board should be a state forester appointed by the board itself. By this arrangement, the forester is responsible to the board, and they in turn will be able to give the proper time to the work, since their other duties will be confined to attending meetings at stated intervals.

Unless forestry work in a state is organized along some such lines, the chances are that sooner or later the organization will prove inadequate, and that the work will stagnate and fall into disrepute, or even become the prey of politicians.

State forestry is in its infancy, but the need for it is urgent. Mistakes in policy are costly and are often entirely unnecessary. A clear-cut policy, persevered in, will succeed, while radical differences of opinion result only in wasted efforts. An understanding of state forestry is needed to direct and unite such efforts. Moreover, a constant interest on the part of the public in the forestry work of the state is the surest guarantee of ultimate success.

The Government's Forest Policy.

By *Gifford Pinchot.*

The policy of the government toward the forests of the country is based upon the following conceptions: (1) The forests are one of the sources of national prosperity, and they should therefore be conserved by wise use; (2) individuals, unaided by example and instruction, are not likely to conserve the forests of their own initiative.

In accordance with these conceptions, the national forest policy aims: (*a*) To manage the forests growing on reserved public lands—the national forests—in such a way that they will yield all their resources to the fullest extent without exhausting them, for the benefit primarily of the home builder; (*b*) to establish the facts and to formulate the principles that underlie the fullest economic utilization of forests, particularly the forests of the United States—in other words to lay the foundations of American forestry; (*c*) to educate the people by example and precept, in the meaning and practice of forestry.

This policy includes, then, the practice of forestry, forest investigations, and forest educational work. The machinery of this work may be described conveniently under three heads.

The practice of forestry.

The work of the Forest Service centers in the national forests. These forests, which lie in the West, comprise 168,000,000 acres, and are divided into 142 administrative units, each of which is in charge of a supervisor. The supervisor is assisted in technical matters by a trained forester, and has under him a number of forest rangers and forest guards, who execute the work on the forests and report to the supervisor. The forest units, beginning January 1, 1909, are grouped in six field-districts, each of which has a central headquarters in charge of a district forester, who with the aid of a corps of assistants, administers all the business of the district that does not need to be referred to the Forester at Washington.

General administration, general inspection, and general accounting are assigned to the office in Washington. In this way, prompt action on all local matters is assured without weakening the central control of policy, efficiency, and the receipt and disbursement of funds. The basic idea in the administration of the national forest is preservation by wise use. They are reserved for use, not from use. The prosperity and progress of the regions in which they lie depend directly upon them. Water for the irrigator, grass for the stockman, and timber for the ranchman, miner, railroad man, and lumberman, now come in very large part, and in the end must come exclusively from the national forests. Thus, all the public in the West is vitally concerned in the results of the national forest administration, and since whatever affects one section affects the whole country, the nation at large is deeply interested in the welfare of these great forests.

In the following tables are given the volume and value of national forest timber sales from 1904 to 1908 (fiscal years) inclusive:

TIMBER SALES.

Fiscal year	Amount of timber sold	Amount of timber cut	Receipts from timber sales
	Board feet	Board feet	
1904 . . .	112,773,710	58,425,000	$58,436 19
1905 . . .	113,661,508	68,475,000	73,270 15
1906 . . .	328,230,326	138,665,000	245,213 49
1907 . . .	1,044,855,000	194,872,000	686,813 12
1908 . . .	386,384,000	392,792,000	773,182 33

In governmental forestry, the policy is to serve the public while conserving the forests. Lands within the forests are not open to entry except under the mining laws and under the Forest Homestead Act of June 11, 1906, which permits lands fit for agriculture and not needed for administrative use to be listed by the Secretary of the Interior and entered. Mining may be carried on precisely as elsewhere on the public domain. In order to meet the wants of settlers, miners, and others needing timber and stone for the development of mines or for domestic use and home building, timber in reasonable quantities is free to such persons. Otherwise timber is sold to the public as desired, provided the condition of the forests permits. Contracts secure the government from the danger of monopoly or speculative holdings.

Grazing is regulated in the interest of the stockmen, who pay for permits and who receive in return the certainty of equitable allotment of range, range protection and improvement, and, in the long run, the very existence of the range itself, without which the industry would be impossible.

The number of head of stock grazed on the national forest range, and the revenue from permits from 1904 to 1908 (fiscal years) inclusive was:

GRAZING BUSINESS.

Year	Number of cattle and horses	Number of sheep and goats	Receipts
1904 . . .	610,091	1,806,722	
1905 . .	692,124	1,709,987	
1906 . . .	1,015,148	5,763,100	$514,692 87
1997 . . .	1,200,158	6,657,083	863,920 32
1908 . . .	1,380,145	7,085,311	962,829 40

The annual expenditures of the government for forestry and national forest administration, and receipts from national forests, from 1898 to 1907 are given in the following table:

Area of National Forests, Annual Expenditures of the Federal Government for Forestry and National Forest Administration, and Receipts from National Forests, 1898 1908.

*Fiscal year	Area of national forests at close of year (June 30)	Expenditures		Receipts from national forests	Receipts from national forests, per acre	Expenditures upon national forests, per acre
		Division of Forestry (Bureau of Forestry, Forest Service)	General Land Office			
1898	40,866,184	$20,000 00	. . . . .	. . . . .	. . . . .	. . . .
1899	46,168,439	28,520 00	$175,000 00	$7,534 83	$0.00016	$0.0038
1900	46,515,039	48,520 00	210,000 00	36,754 02	.00078	.0045
1901	46,324,479	88,520 00	325,000 00	29,250 88	.00063	.0070
1902	51,896,357	185,440 00	300,000 00	25,431 87	.00049	.0060
1903	62,211,240	291,860 00	304,135 00	45,838 08	.00074	.0054
1904	62,611,449	350,000 00	375,000 00	58,436 19	.00093	.0072
1905	85,693,422	†632,232 36	†217,907 64	73,276 15	.00085	.0059
1906	106,994,018	1,190,419 78	. . . . .	767,219 96	.00717	.0089
1907	150,832,665	1,790,678 79	. . . . .	1,571,059 44	.01041	.0097
1908	167,976,886	2,905,655 88	. . . . .	1,842,281 87	.01096	.01729

*The United States fiscal year ends June 30, and receives its designation from the calendar year in which it terminates. Thus, the fiscal year 1898 is the year July 1, 1897–June 30, 1898.

†Administration transferred to Forestry Service February 1, 1905.

In order to promote to the utmost the building of homes and the settlement of the country, permits are issued for a great variety of activities within the forests, from the use of land for the development of commercial water-powers to the establishment of a hotel or to the running of an apiary. Every available resource within the forests should be fully developed.

Forest investigations.

Though the principles of forestry are everywhere the same, their application differs with conditions. Consequently, while the American forester may freely consult European authorities as regards the methods of his science, he finds in the American forests new problems that he must solve independently. The Forest Service has carried on a great number of forest investigations, principally in coöperation with private persons, companies, and corporations, and in this way has secured results of great value to silviculture and utilization. When, however, the national forests were placed under the control of the Forest Service (July 1, 1905) it was realized at once that the national forests offered most important opportunities for scientific work which could not be successfully undertaken spasmodically or interruptedly.

The actual business on the forests necessarily engrossed the full attention of the Forest Service until the administration could be so perfected as largely to become routine. This once accomplished, it became possible to plan investigations on the forests, and with this end in view forest experiment stations, six in number, will be established in the six most typical western forest regions. At these stations will be developed carefully planned and coördinated schemes of research covering every aspect and condition of forest life. The results, gradually attained through shorter or longer periods will make it possible to develop a truly American silvicultural practice, that will be applicable not only on the national forests but also on similar private lands.

Among the investigations that have been fruitful of practical results are timber tests, tests of preservatives used to lengthen the life of timbers in service, experiments with substitute woods for pulp, studies involving the saving of lumbering and milling waste, and improved methods of kiln drying. By means of these, uses have been found for woods previously discarded or undervalued, and a closer utilization of the tree and of the log has been secured. Not least effective among the fruits of investigative work have been the annual reports of lumber production, in coöperation with the Bureau of the Census, which give returns of great value both to government workers and to those engaged in the lumber industry.

Among the more important scientific investigations planned for the future, through the machinery of the forest experiment stations, will be the relation of forests to stream-flow, particularly in the western country, where the permanent value of the irrigation works and the future development of electricity by means of water-power are known to be bound up with the forests that control the streams.

The investigative work of the Forest Service is administered from Washington, where offices in charge of specialists plan and conduct the various projects.

Forest education.

Whenever, in the course of research or practice, results are obtained that constitute a fresh contribution to the science or art of forestry, the material is put into shape by the man in charge of the work, edited by one of the reviewing staff in the office of publication, and printed in the form of a circular. Such publications receive the widest possible distribution among those whose interests are affected by the subject treated. By these means, the latest achievements in every department of forest work are made available to the public and fresh achievements are suggested and encouraged. Particular care is taken in the preparation and distribution of publications to present the material concisely, accurately, and clearly, and to place it in the hands of all who require it. During the fiscal year ending June 30, 1908, seventy-five circulars were published, and these received a distribution, localized and classified, of 4,326,600 copies.

From the office of the Forester at Washington information is supplied without discrimination to all persons interested in forest questions and the work of the Service. This information goes to publishers of newspapers and magazines in the form of bulletins recording the progress of forest science and practice in general and the progress of the undertakings of the Forest Service in particular. In addition, information is furnished by letter in response to inquiries from every source. In these ways, the public is apprised of the status of forestry in all parts of the country and is in constant touch with the aims and methods of the government.

The economic importance of forest conservation makes it incumbent upon every intelligent person, young or old, to familiarize himself as far as possible with the rôle of the forest in the life of the nation. The depletion of our forest resources has come upon us so quickly and unexpectedly that public opinion would otherwise be quite unprepared to grasp the situation or to trace the consequences of forest waste.

Our school books have been dealing with the forests without realization of the extent to which forest resources have dwindled under the old methods of misuse. There is need of a fresh treatment of the forest in our geographies, histories and text-books of civics—and even in our commercial arithmetics and wood-working classes—that will bring out more clearly, more accurately, and more emphatically the fact of our dependence upon the forests.

We need to know to how great an extent the development of our industries, the perfection of our civilization, have been due to the existence of available wood in great quantity and to the conditions, geographic, industrial, and social, that are traceable to forest influences, immediate and remote. The educational work of the Service consists largely in drawing attention, through its publications and correspondence, to these facts. It aims to contribute to the development of a type of citizenship that will find in the conservation of natural resources—forests, water, mines, and soil alike—a patriotic duty.

But in addition to this work of education, the Service endeavors constantly to bring home by specific examples and concrete advice the practical and pecuniary advantages of wise forest use. To this end, it coöperates with private individuals, furnishing experts to give advice upon the solution of definite forest problems, such as the management of timber tracts and woodlots, the erection and operation of timber-treating plants, the handling of lumber in the yard and in the kiln, the utilization of waste, and many similar problems.

The national forests, besides the benefits resulting directly from good administration, are destined to be of great value as educational factors, as object lessons by which the public, and timber landowners in particular, may profit. The results obtained on the forests are frequently applicable elsewhere, with slight modification. But more than this, the mere fact that there are national forests, successfully managed so as to yield their resources without waste, and at the same time so located as to safeguard perpetually the sources of usable water in the great western region, cannot fail to exert a profound and beneficient influence on the thoughts and habits of the people, by familiarizing them with the benefits and methods of forest conservation.

IRRIGATION POLICIES

Irrigation is of two purposes,—to increase the crop-producing power of land that is cultivated under rainfall moisture, and to bring into cultivation lands that receive too little rainfall for the profitable production of crops. The former use of water is yet little employed, although here and there it is becoming a feature of specialized farming; it will increase as land-pressure begins to be felt. No distinct economic or social policies or institutions have developed about this kind of irrigation in this country.

The second or reclamation service of irrigation involves large areas and makes it possible for populous communities to arise. Reclamation irrigation therefore necessarily develops far-reaching economic policies and results in social institutions. It is this statutory and organizational phase of irrigation that we are now to consider. Irrigation practice and engineering are discussed in Vol. I.

Guide to the literature of irrigation is indicated on page 436, Vol. I.

Irrigation Institutions in Different Countries.

By *Elwood Mead.*

The increased volume of water required by the world's irrigators has made titles to water a matter of great importance. Every acre of land irrigated has some kind of right to the water used. Often these rights are more valuable than the land irrigated. For example, in arid regions, when water rights are separated from land, the tendency is for values to inhere in the water rather than in the land. No matter whether the water used is taken by direct diversion from streams, from storage works, or pumped from underground supplies, the need for definite legal principles to determine the nature of water rights, and for adequate governmental protection to those rights, has increased enormously in recent years, and will continue to do so with the growing need and greater scarcity of the supply. Water is becoming a form of property of constantly increasing value, and legislation regarding rights to water is receiving increasing attention. The laws and customs governing the control of public water-supplies, the business and social arrangements under which works for the diversion and distribution of those supplies in irrigation are constructed and operated, and the social and business relations of water users to each other, form what are known as irrigation institutions.

Water rights.

India.—In India, the greater part of the land and all of the water belongs to the state, which, in cases of scarcity, regulates the division of water among irrigators under government works. When land and water are both the property of the state, water rates are collected as a part of the land taxes, and the cultivator who has once used water must pay for it whether he uses it or not. In times of drought, when water can not be had, neither land nor water taxes are collected. The river is practically considered a part of the canal. When private parties construct irrigation works, they must secure permits from the irrigation officials. When this is likely to work an injury to existing irrigators, compensation must be paid, the amount of the compensation being awarded and fixed by the government. The provisions against stealing water are exceedingly stringent. When gates have been raised and land received water to which it is not entitled, the owner of the land is made to pay double rates. If the water is running to waste, and the party responsible for the waste can not be found, the owners of the lateral are held to be jointly liable.

Ceylon.—Until 1889, the protection of water rights in Ceylon was a matter of communal regulation; the fact that irrigation is largely based on storage in that country rendered this possible. The minor differences in these municipal regulations have been remedied by a consolidated measure that recognizes provincial irrigation bodies but creates a central irrigation board. All of these officers are now nominated by the government. Under these regulations, land owners are forbidden to irrigate fresh fields unless there is a surplus of water. In seasons of drought, rotation is practiced, water being divided among all users and priorities of right not being recognized. Thefts of water are severely punished.

Java.—Water is controlled in Java by the government through the Department of Public Works. Rights to water go with lands and are inseparable from the land. Lands can be held by natives only; the lands cultivated by Europeans are leased from the natives, the water right going with the lease of the field. In times of scarcity, the use of the water is rotated. The length of the growing season is nineteen to twenty-nine weeks, and as the possible season of growth is longer than that, the irrigation officials compel the planting of fields at different dates so that some can be irrigated after the crops from others have matured.

Egypt.—When the English took possession of Egypt in 1882, the water-right abuses were serious. The rich took as much as they wanted, and the poor took what was left. Hence, there was great waste and great injustice in the use of the Nile. To secure an economical and just division, the distribution of water was placed under the absolute control of the government, and a system of rotation under a rigid schedule established. The canals were formed into groups, each canal having water part of the time and being deprived of it part of the time. The amount of water allowed and the periods of irrigation were made to depend on the crops. Cotton has a daily allowance of 1,000 cubic feet for every acre; rice, twice that volume. The periods between irrigations vary from one to twenty-four days. During periods of scarcity between 1890 and 1900, an attempt was made to irrigate cotton with an allowance of 700 cubic feet per day for an acre, but it proved insufficient.

France.—In France, all navigable streams belong to the state. Navigation, however, is held to be inferior to irrigation, and rights to divert navigable rivers are granted by decree. Such licenses are always subject to revocation and an annual rental is required for the water diverted. On non-navigable streams, every owner of riparian lands is entitled to take water for the irrigation of his lands. If, in order to reach them, his ditch must cross the lands of other proprietors, he can command a right of way. These water rights are matters of record and the oldest one has the best right to water. What is said to be the oldest ditch recorded dates from 1428.

Spain.—In the Spanish provinces bordering on the Mediterranean, water rights date from the time of the Moors and are largely based on custom. The general water law of Spain was passed in 1866 and modified in 1879. Under these laws, parties desiring to use water for irrigation must obtain a permit from the state and are given twenty years in which to build the necessary works and to put the water to beneficial use. Any water right that is attached to land is perpetual, but a water right for companies to sell or rent to others is limited to ninety-nine years. Both under the Moorish and the modern Spanish laws, priority of right is recognized and no new diversions of water are made until a gauging of streams shows that there is a surplus. Underground waters, either subsoil or artesian, belong to the one who brings them to the surface, unless it can be proved that the new right interferes with older rights of this character; in such case, the developed water has to be abandoned.

Italy.—All unappropriated water in Italy belongs to the state. Permits are required to divert this water. These permits are made by the Department of Public Works, the requests having first to be approved by the Departments of Public Works, War, Finance and Agriculture. No licenses are perpetual. As a rule, they are limited to thirty years, and payment for the water taken is required.

The ancient water rights of Italy vary widely in character. Some of the older works were built by the rulers of provinces, who sold, for large cash payments, perpetual rights to receive water. Such a right entitled the purchaser to have the water delivered at his farm free of any part of the running expenses of the canal. Rights of this character are a great source of injustice and burden on other irrigators, and are being abolished whenever possible.

Australia.—In all of the English colonies and the United States, water rights are influenced by the English law with respect to navigable waters, and the extent to which the English common law regarding riparian rights has been recognized.

No country has given more careful and systematic study to water-right legislation than Australia, and the definitions regarding water rights in the provinces of Victoria and New South Wales are among the best to be found in the irrigation codes of any country. Those to be found in the Water Conservation Act of New South Wales are so brief and clear that they are given entire:

§5. To the Crown belong—subject to the provisions of Section 6, of this Act:

(*a*) The water flowing or contained in every river, stream, creek, or watercourse, whether the said river, stream, creek, or watercourse be permanent or intermittent, and whether flowing wholly or partially through or under Crown Lands.

(*b*) The water contained in every lake or other collection of water, whether such lake or other collection of water be situated on, within, or under Crown Lands, or private lands, or lands belonging partly to the Crown and partly to private individuals.

(*c*) All springs situated within Crown Lands, and all springs whether situated in Crown Lands or in private property which have overflowed into or contributed water to any river, watercourse, or lake.

(*d*) The right to control for the purpose of this Act the bed of any river, watercourse, or lake.

§6. The owner of any land shall in virtue of ownership, occupation, or right of possession of such land, have a right to the use of water as follows, that is to say:

(*a*) The whole of the rain which falls on such land, and which shall have been conserved thereon by the owner.

(*b*) So much of the water of any river, watercourse, or lake upon or adjoining such land as is required by the said owner for domestic use and for the watering of stock; provided always that no owner of such land shall have a right to a larger supply of water than at the rate of 2,000 gallons per day for every mile of river, watercourse, or lake frontage.

(*c*) Except as provided in Section 5, sub-section (*c*), the exclusive right to the use of any spring of water rising or situated in such land, if neither any other person or persons, nor any corporation has acquired a right to such spring or to a portion of the water from it by uninterrupted use for a period of not less than twenty years.

(*d*) The right to obtain a supply of water by sinking or boring in such land.

§7. Whenever the owner of any land has been for a period of not less than twenty years allowed the use free of charge or hindrance of a supply of water, whether permanent or intermittent, running from or through or situated in any other land, such owner shall have a permanent right to the use of such supply of water; but only to the extent required for his domestic purposes and for watering his stock.

§8. Any person who has under this Act a right to a supply of water from a river, watercourse, or lake, or from any spring, or from any underground source, may claim and obtain compensation from any person who shall interfere with, injure, or destroy or diminish such supply; but on the person making any such claim for compensation will rest the onus of proof that actual damage has been done to him, and no compensation shall be allowed unless the said claimant shall prove damage or injury.

§9. Wherever the owner, lessee, or occupier of land adjoining a river or lake has already arranged or wishes to arrange for the abstraction or diversion of a supply of water for domestic use, or for the use of stock, and for the conveyance of such supply, whether in natural or artificial channels, a license for the abstraction or diversion of such supply must be obtained from the Minister or from the Water Trust having jurisdiction in such case. Wherever supplies for domestic use or for stock are now being conveyed or diverted from any river or lake, the owner of such works or appliances must, within three months after the passing of this Act, obtain a license for the further use of such works or appliances.

Canada.—The irrigation laws of Canada make water a national property, the rights to water being recorded in the Dominion records instead of in each of the separate provinces. The irrigation act contains the following provision:

(1) That the water in all streams, lakes, ponds, springs, or other sources is the property of the Crown.

(2) That this water may be obtained by companies or individuals for certain described uses upon compliance with the provisions of the law.

(3) That the uses for which water may be so acquired are "domestic," "irrigation," and "other" purposes, domestic purposes being limited to household and sanitary purposes, the watering of stock, and operation of railways and factories by steam, but not the sale or barter of water for such purposes.

(4) That the company or individual acquiring water for irrigation or other purposes shall be given a clear and indisputable title to such water.

(5) That holders of water rights shall have the protection and assistance of permanent government officials in the exercise of such rights.

(6) That disputes or complaints regarding the diversion or use of water shall be referred to and settled by the officials of the government department charged with the administration of the act, and that decisions so given shall be final and without appeal.

All rights to water granted for irrigation in Canada are for specific areas. No licenses are issued to ditch companies until they have made contracts or agreements with the owners of these lands to take water. Under the Canadian law, the irrigation season and the duty of water are fixed by the Minister, and the streams are divided in accordance with the Minister's ruling. Priority in the use of water gives the first right. The amount is based on the acreage irrigated and the duty fixed by the Minister.

The United States.—In the United States there are conflicting views as to the nature of the rights, there is conflicting jurisdiction in the courts that determine rights, and there promise to be grave complications over state and national control of public water-supplies. Thus far, water rights for irrigation have been established in accordance with state laws and customs and streams have been divided by state officials, Congress, in 1866, having enacted a law recognizing local laws and customs in the use of water for irrigation, mining and other beneficial purposes. (See Hess, page 160.)

The water rights of the western states fall into two classes: those based on the common-law doctrine of riparian rights, and those based on what is known as the doctrine of appropriation. The riparian law, as construed by western courts, gives to the owner of the lands abutting the stream the preferred right to use its waters. Under it, non-riparian lands, even if more fertile and better adapted to irrigation, can not be irrigated if this conflicts with the use of the stream by the owners of the riparian lands.

The law of appropriation gives to those who take and use water in irrigation the right to the perpetual and free use of the amount appropriated, the rights of appropriators following after each other in the order they were acquired. The first appropriator has the right to the full amount of his appropriation before later rights can be recognized, and in like order down the entire list until the stream is entirely diverted. The doctrine that priority of time gives priority of right gives a working rule for apportioning streams in times of scarcity, but there is no such rule for division of a scanty water-supply under the riparian doctrine. There can be no priorities among riparian proprietors.

Another unsettled question is the width of what are entitled to be classed as riparian lands. Bonanza land owners have estates that stretch back twelve miles from the river. Small land owners have tracts that do not reach a quarter of a mile from the stream. Does the riparian right extend twelve miles from the stream in the case of the large estate, and shrink to one-fourth of a mile from the stream with the neighboring small farmer?

States that recognize riparian rights, alike with states that have abrogated that doctrine, provide for the appropriation of water. The amount of the right is, in theory, based on the quantity beneficially used, but, owing to the lax and imperfect methods of procedure, gross injustice and abuses have been created by granting rights for two to one hundred times as much water as has ever been beneficially used. These surplus and excess rights have subsequently been either utilized or sold, and have given rise to harassing and expensive litigation. Water monopoly is the danger of western agriculture. In other countries, perpetual water rights are attached to the land irrigated. In the western states, both classes of rights can be sold and separated from any fixed place of use. This makes it possible for others than water users to acquire control of the entire water-supply and levy an oppressive tax on its agriculture.

Leaving the establishment and protection of water rights to the state makes no provision for the protection of rights on interstate streams. As state boundaries do not agree with drainage boundaries, many of the streams most used in irrigation cross state lines. Under existing laws, there is no method of protecting the older rights of irrigators in the lower states from the encroachments of later irrigators in the states above. The same defect exists in many of the states in which the establishment of rights has been left to county officials. Some streams cross half a dozen counties, and the rights are established separately in each county, with no provision for protection of the rights of irrigators in the lower county against encroachments from above.

Although the original policy of the government of leaving the establishment and protection of water rights for irrigation to the several states was affirmed in Section 8 of the National Reclamation Act of 1902,[1] nevertheless the federal government does exercise a large control over irrigation, and this seems destined to be extended rather than diminished. Navigable waters are under the jurisdiction of the Secretary of War, and plans for any structures that will interfere with navigation must be submitted to the chief of engineers for his approval. There are several navigable streams in the arid region. The value of the water for irrigation is far greater than for navigation, but the chief engineer has no authority, under the law, to consider the relative importance of irrigation and navigation. In several cases when his approval was withheld, the construction of irrigation works has been prevented. Since the passage of the National Reclamation Act, the federal government has begun works to divert navigable streams. In every case, a special authorization for the work was obtained from Congress.

The construction and management of irrigation works.

Egypt and India.—In both Egypt and India, the construction of large and costly irrigation works by the Government has been rendered safe and simple because of the dense population, the absolute necessity for irrigation, and the ownership of both land and water by the state. In both countries, the investments in irrigation works have been profitable directly, as well as contributing greatly to the comfort of the people and the wealth and prosperity of the country as a whole. The $200,000,000 expended on irrigation works in India brings an average return of about 4½ per cent on the investment. There is no separate account in Egypt, but the returns are even more satisfactory because of the higher rates for water.

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[1] "Nothing in the act is to be construed as affecting, or in any way interfering with, the laws of any state or territory relating to the control, appropriation, use, or distribution of water used in irrigation."

Java.—In other countries, the chief return to the state has been in the contribution to the general welfare. In Java, where, in 1904, the government expended $924,000, and in the ten years preceding, $5,600,000, the chief profit has come from the greater prosperity of the people, not from any direct return. It has, however, increased the population 48 per cent in thirty years, or from 777 to 1,181 to the square mile.

In France, all irrigation works are in private ownership. One, the Monasque canal, was built by the state at a cost of $900,000, but turned over to a syndicate of irrigators who operate it and collect the water rentals. The state is to be reimbursed by receiving 70 per cent of the net income for fifty years. The state has, however, subsidized a large number of costly works, giving outright a certain percentage of the first cost, usually one-third. Between 1874 and 1882, an experiment was tried in guaranteeing the income of irrigation works. This was a failure, because farmers would not pay for water from canals when the income was assured. The government of France also aids irrigators by loaning them money at 2 to 3 per cent, and by giving free advice to farmers and land-owners about preparing their land, or to irrigation companies in the preparation of plans for canals. The irrigation works of France are, as a rule, owned by irrigation associations, of which there are 3,387.

Italy.—The distinctive economic feature of irrigation in Italy is the extent to which the principle of coöperation in the construction and management of irrigation works has been developed. The policy of the Italian government is to aid these irrigation associations to construct canals, rather than to build them itself. The government is the owner of a number of irrigation works that were state property at the time the kingdom of Italy was established, and others that were taken over on the failure of subsidized companies, the most noted of these being the Cavour canal. One of the largest and costliest canals in Italy, the Villoresi, is a private corporation canal, but the most successful modern works are those built and operated by farmers' associations. The costlier of these works, either for irrigation or for drainage, are aided by the government in the following manner:

The plans and estimates are either prepared or the preparation superintended by government engineers. Bonds, based on these estimates are authorized and are sold to specially charted government banks, which exercise a supervisory control over the expenditure of the money in construction. These bonds run for thirty years with interest at five per cent. Of this interest, the government pays 3 per cent for the first ten years, 2 per cent for the second ten years, and 1 per cent for the third ten years. This government guaranty makes these bonds an attractive investment and assures their ready sale at par or at a premium.

In Spain, the policy is to encourage the formation of district associations to build the works and distribute the water, and, whenever the amount of land irrigated from any system of ditches reaches 500 acres, the irrigators are compelled to organize into a society. The government aids in the construction of costly works, paying in some cases 50 per cent of the estimated cost of the main canal, and lending the companies 50 per cent of the money to build lateral ditches. This money has to be repaid to the government with interest at 3 per cent, the interest and principal being a tax on the land irrigated.

In Australia, the government has aided in the building of several diversion dams and a few canals. This work has been unprofitable, the government having surrendered all claim to the return of the greater part of this outlay.

Canada.—All irrigation works in Canada are private works, the government neither building works nor extending any financial aid.

United States.—Up to 1902, practically all irrigation works in the United States were built by private enterprise, a few state works in Colorado being the only exception. In 1902, Congress passed what is known as the National Reclamation Act. Under it, the proceeds from the sales of public lands formed a fund to be expended in the construction of irrigation works. The act, which is given below entire, places the management of this fund under the direction of the Secretary of the Interior, who has delegated it to the Reclamation Service. The Reclamation Service has a wide authority conferred on it, both in determining the location and character of works, and in fixing the payments to be made. Under the law, the fund expended in the construction of government work must be repaid in ten equal annual installments.

The general experience of irrigated countries is that, when land and water are united, the government construction of irrigation works can be made safe and profitable. The experience with new and sparsely settled countries is that the development of unsettled areas is slow and the returns from irrigation works for a number of years are small. This situation has been aggravated in the United States by defects in the land laws, which permitted of the speculative filing on the lands to be irrigated. This has been corrected, under the National Reclamation Act, by permitting the segregation of the lands in advance of construction.

This law is one of the most important pieces of legislation, so far as the industrial development of the western half of the United States is concerned, that Congress has ever enacted. It will not only make possible the construction of many works that private enterprise would not have undertaken, but it will inevitably bring about a larger measure of public supervision in the distribution of water than it has hitherto been possible to secure under state laws. It will also, it is hoped, help to end the unwise and profligate surrender of streams to private ownership, a practice that has been going on since the beginning of irrigation development. The importance of this act warrants a synopsis of its principal features:

Section 1. The receipts from the sale and disposal of public lands in Arizona, California, Colorado, Idaho, Kansas, Montana, Nebraska, Nevada, New Mexico, North Dakota, Oklahoma, Oregon, South Dakota, Utah, Washington, and Wyoming, are set aside as a reclamation fund to be used in the examination and survey and for the construction and maintenance of irrigation works in the states and territories named.

Section 2. The work provided for in this act is to be under the direction of the Secretary of the Interior, who is to report to Congress at the beginning of each regular session the results of his operations under the act.

Section 3. Before giving public notice, as provided for in Section 4, the Secretary of the Interior may withdraw from entry, except under the Homestead Law, any lands that can be used for the proposed irrigation works, and any public lands believed to be susceptible of irrigation, from said works. The commutation clause of the Homestead Law does not apply to entries made under this act.

Section 4. Upon the determination by the Secretary of the Interior that any irrigation project is practicable, he may let contracts for the construction of the proposed works, provided the necessary funds are available, and shall give public notice of the lands irrigable under the project, the limit of area per entry and the charges which shall be assessed against homesteaders on the public land, and owners of other lands which are to be irrigated, and the number of annual installments, not exceeding ten, in which these charges shall be paid and the time when they shall commence. The charges are to be determined with a view to returning to the reclamation fund the estimated cost of the works.

Section 5. The entryman on lands to be irrigated shall, in addition to compliance with the homestead laws, reclaim at least one-half of the total irrigable area of his entry and shall, before receiving patent for the land, pay the charges proportioned against him. No right to the use of water for lands in private ownership shall be sold for a tract exceeding 160 acres to any one land-owner.

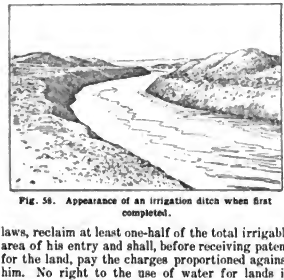

Fig. 58. Appearance of an irrigation ditch when first completed.

Section 6. The works constructed under this act are to be operated and maintained at public expense, but they may be turned over to the purchasers of water to be maintained and operated by them, such operation to be at their own expense under such rules and regulations as may be acceptable to the Secretary of the Interior; but the title to the works, and their management and operation, is to remain in the government until otherwise provided by Congress.

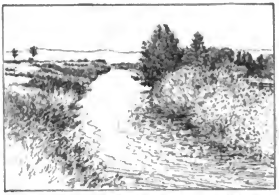

Fig. 59. An irrigation ditch ten years after completion.

Section 7. Rights and property which are necessary to the carrying out of the provisions of the act may be secured by purchase or condemnation.

Section 8. Nothing in the act is to be construed as affecting, or in any way interfering with, the laws of any state or territory relating to the control, appropriation, use, or distribution of water used in irrigation. The right to the use of water is to be appurtenant to the land irrigated, and beneficial use shall be the basis, the measure, and the limit of the right.

Section 9. So far as practicable, the major portion of the funds arising from the sale of public lands within each state and territory is to be expended in the state or territory where it arises, but the Secretary of the Interior may temporarily use the funds in other states, provided that, at the end of each ten-year period after the passage of the act, the amount expended in each state or territory shall be in proportion to the amount contributed by it.

Section 10. The Secretary is authorized to make all rules and regulations necessary to the proper carrying out of the provisions of the act.

It must not be understood that the enactment of the Reclamation Act eliminates all private enterprises in irrigation. On the contrary, all the works planned by the Reclamation Service will reclaim less than 2,000,000 acres, while private enterprises has reclaimed five or six times this area, and more land is at present being reclaimed by private parties and under the Carey Act (page 166) than under the Reclamation Act. Various organizations are typical of this private and quasi-public irrigation, as mutual companies, irrigation districts, and Carey Act companies. The Reclamation Act provides that works built under its terms may be turned over to companies composed of the water users (Section 6, above).

Further Discussion of American Irrigation Policies.

By *R. H. Hess.*

Irrigated agriculture was one of the earliest arts of eastern civilization, and has long been highly developed in southern Europe and in parts of Asia and Africa. In the United States, irrigation is older than existing races, and much evidence still exists of prehistoric irrigation works of considerable excellence and magnitude in the valleys of Arizona, New Mexico, and southwestern Colorado. Despite the antiquity of irrigation, artificial watering of arid lands is comparatively new as an important factor in the industrial development of the United States. A few Pueblo Indians and Mexicans of the Southwest have maintained primitive irrigation systems since time before record, and the Mission fathers near the Pacific sustained themselves by irrigated crops for nearly a hundred years before the coming of the Anglo-Saxons. Excepting these feeble efforts, irrigation was unknown in America until the advent of the Mormon colony in Utah.

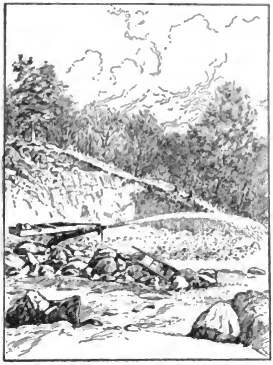

Fig. 60. A hydraulic giant. An immense amount of water is annually diverted for gold mining.

The substantial beginnings of the Utah system were drawing their first fruits from the valleys dipping westward from the Rockies when the Siera Nevada mountains were invaded by the gold hunters and the industrial history of California began. Water was first diverted from California streams for placer mining, but was soon given a second utility in a successful attempt to supplement the meager food-supply of the miners by the irrigation culture of fruits and vegetables. (Fig. 60.) The Pike's Peak boom occurred ten years after the California pilgrimage and the events of 1849 were then reënacted in Colorado under slightly different conditions but with similar results in the use of water for mining and agriculture.

It is significant that the three groups of pioneer irrigators, located in the basin of Great Salt Lake, on the Pacific slope, and in the Platte valley of Colorado, were so isolated and independent. These communities, while practically simultaneous in the inauguration of their respective systems, were separated by hundreds of miles of difficult mountain and desert country, were without communication, and consequently were ignorant, each of the others' activities. For this reason, each was free to develop a system of irrigation practice and law in accord with local necessities and prevailing opinion of equity and economy.

There is no reason to believe that foreign methods were of any influence in directing irrigation practice in western America when the industry was young. Few, if any, western pioneers were in the least familiar with foreign irrigation, and, had they been familiar with European systems, prevailing physical and social conditions were such that principles and methods obtaining abroad could not have been successfully applied.

The fact is to be emphasized that the American irrigator, yielding to the influences of his environment and subject to official and judicial agencies unfettered by ultra-conservative conceptions of law and doctrine, has pursued policies which go to form an irrigation system indigenous to the United States. This system, from the beginning, has been characterized by continuous and rapid modification and expansion in response to the demands of industrial and social development.

The doctrine of appropriation.

To the irrigation farmer, the right to a definite flow of water through his ditches for use upon his land is prerequisite to crop-production and to land values. In humid countries, land is the primary subject matter of real property. In the arid country, land is superabundant and the natural supply of water is so limited as to necessitate its concentration upon a fraction of the available land to effect production. It is not surprising, therefore, that, in the occupation of western America, traditional Anglo-Saxon property rights, failing to conserve the general welfare, have been overturned, and society has endeavored to establish and maintain such property rights in natural resources as appear essential to present and future well-being. In this land of drought, water is the least abundant natural element of productivity and, hence, the fundamental and most desired object of property. As a result of these facts, water rights unknown to the common law have been established and have come to rest upon the so-called doctrine of appropriation.

The nativity of the doctrine of appropriation was contemporary with the exploitation of the gold fields of California in 1848. The lands upon which the precious metal was found belonged to the United States and, at that time, were unsurveyed and not legally open to occupation. Within a few months after the discovery of gold, the mineral fields were populated by thousands of fortune seekers. These people were without legal means of securing property rights in the unappropriated natural resources of the country. They knew no code of law and possessed no trained legislative, judicial, or executive agents. But the necessity for order soon put on foot a semblance of law and administration. Miners held meetings in the different "camps" and enacted regulations by which, in lieu of higher law, they agreed to be governed. The object of the codes of the early Californians was to secure, within practicable limits, personal safety and equity in acquiring and operating mines, and to define justifiable property rights in natural resources. To best accomplish this, he was first in right of possession who was first in time of occupation, and an uninterrupted utilization of the right gave a coextensive claim against all others except the nation. In this doctrine of proprietorship in natural resources, discovery followed by appropriation is recognized as a basis of title, and a reasonable use or a specified development of the property thus acquired is held necessary to its retention.

The above doctrine of property rights was first applied to mineral lands on the public domain; but flowing water assumed a relation to the industry of the West, by virtue of its scarcity and the necessity of its use in both mining and agriculture, comparable in importance to that of the placer sand, the quartz vein, or the soil itself. Each was worthy of a use, each was limited in amount, and if a rule, if appropriation and use were justifiable as an essential of property rights in the one, it appeared likewise a worthy basis of property in the others. So the economic law of expedience and a native sense of justice declared that he who first turned the waters of a stream from its course, or of a lake from its bed, and applied them to beneficial use, was first in a right commensurate with that use. This right was inaugurated by the placer miners of California, and for a time was defended as their exclusive prerogative, but the application of a stream of water to an area of placer ground for the direct extraction of gold differs not, in principle, from the appropriation of a stream to the soil for the creation of value through the medium of agriculture. Upon these premises was established the doctrine of priority of appropriation which supports the water right of the arid districts of America. This development of property in water was not peculiar, however, to California, for the same principle was worked out in Utah and successfully applied under slight modifications incident to the community interests of the Mormons. In the subsequent settlement of Colorado and other sections of the arid country, the doctrine of appropriation was universally adopted as a fundamental theory of property in water and as a prerequisite of industrial activity.

Abrogation of the common law.

The American law of property was primarily acquired by the general adoption of the common law of England in the colonies. From the begining, innovations in the nature of property rights, have met with strong opposition, not only because of vested interests in established property, but because of a stubborn judicial contention that the common law presents a comprehensive conception of the sphere of private property. Under the common law, property, in natural waters, is confined to the ancient riparian right, which grants to every proprietor of lands on the banks of a stream equal rights to the use of the water which flows adjacent to his land. He has no property in the water itself, but a simple usufruct while it passes along. Though he may use the water while it runs past the land, as an incident to the land, he cannot unreasonably detain it, or give it another direction, and he must return it, without diminution in quantity or alteration in quality, to its ordinary channel before it leaves his estate. This riparian right limits the use of inland waters, not navigable, to the proprietors of their banks, and to such purposes as exclude irrigation.

The common law is purely an Anglo-Saxon institution. With the settlement of western America came the first experience of the Anglo-Saxon in an arid climate. From the beginning of history, this conquering race has been content to take for itself the humid parts of Europe and America, leaving for its weaker Romanic rival the supposedly less productive arid reaches of the continents. But the change of environment, most marked in unfamiliar climatic conditions, reflected itself in a revolutionized industrial system and in reconstructed codes of law. Of present significance is the development of a new utility in inland waters, and, consequently, of a new species of property in streams, lakes, submerged waters, and even mountain snows for purposes of irrigation and mining.

Until 1851, the status of the law in the West remained as formulated by the miners in their codes of local authority. In that year, the first legislature of California gave those voluntary regulations legal efficacy by statute. For eighteen years, the local codes, as sanctioned by statute, constituted the law governing property rights in mineral lands and flowing waters on the public domain. The sale of mineral lands was not authorized until July 26, 1866. In the first section of the act of that date, it was declared that mineral lands of the United States were free and open to exploration and occupation, subject to such regulations as might be prescribed by law and the local customs or rules of the inhabitants of the several districts, as far as the same were not in conflict with the laws of the United States. The act further provided that water rights established by priority of possession should be maintained and protected, and the right of way for canals and ditches for the purpose of diverting water for mining, agriculture, or mechanical use was acknowledged and confirmed. By this law, proprietors were enabled to establish permanent rights by government patent, and, by an act of July 9, 1870, all subsequent patents were issued subject to previously vested water rights.

The federal statutes mentioned above paved the way for formal abrogation of the common-law doctrine of riparian rights throughout the arid regions and for the confirmation of the new doctrine of appropriation, as applicable to both land and water. Excepting California, the arid states and territories of the United States[1], together with provinces of Australia and the northwest territories of Canada, have formally abrogated the common law as affecting the use of flowing water.

The California system.

Although the doctrine of appropriation was worked out and first logically applied in California, conflicting interests resulting from the geographical extension of industries induced the nominal abandonment of the principle and an attempt to return to the common law. In order that the common law may prevail, climatic conditions have necessitated the expansion of the doctrine of riparian rights to recognize the use of inland waters for irrigation. In accomplishing this purpose the courts have redefined and supplemented certain terms of the old doctrine, and some of its elements have been abrogated entirely. California has been joined by several semi-arid states[2] in the attempt to adapt the common law to the needs of an arid climate. These states, because of dissimilar interests in sections subject to a variety of climatic conditions, find it desirable to seek a middle ground and an elastic, although uncertain, principle of water rights.

In reconstructing the riparian doctrine, the courts have held the use of water for irrigation, formerly conceived to be an artificial and extraordinary use as opposed to "natural" and "ordinary" uses, to be reasonable and within the meaning of the common law. The forbidden "diminution of the flow or alteration in the quality of the stream" has been modified by the conveniently elastic adjective *substantial*, which is interpreted to infer nothing less than a measurable injury to riparian proprietors above or below, and which has frequently been held to justify such use of streams as shall inflict the least possible injury to other proprietors consistent with the exigencies of the case. "Riparian lands" has been variously and arbitrarily defined with respect to the nature of title and extent back from the stream. Courts have even denominated lands of one watershed as riparian to streams of another, the diversion and return of water at points on the land of the appropriator has been widely held to be an unessential element of the common law, and rights of way for irrigation works have been frequently acquired, by condemnation.

Under the California system, the original property right in the use of a stream is the common-law right of the riparian dweller. The theory of the law is that all water rights initially attach to riparian lands, but that they may be granted away from the land by the owner and, thereafter, become property subject to separate ownership and, within certain limits, to the ordinary processes of sale and conveyance. The customary appropriation of water privileges upon public lands has been construed to be a grant of the riparian rights by the United States as land owner, and, since the streams of the arid country were largely so appropriated before the title to the land passed from the government, the California system, despite its recognition of the common law, partakes largely of the nature of a system of ownership through appropriation and beneficial use. The California system asserts that the appropriators of land and water upon the public domain derive their rights by presumed grants from the United States under the property concept of the common law, and that neither the general government nor the several states, as law makers, may define the nature of real property within their boundaries.

The Colorado system.

The Colorado system of irrigation law recognizes a utility and consequent property object in water for irrigation peculiar to an arid environment and unknown to the common law. Its theory of water-rights asserts that the equitable appropriation of this utility justifies a property right inconsistent with the old riparian right, and establishes such a property upon the basis of the doctrine of appropriation. In creating this system, the courts have observed that the rule of legal precedent is not absolute, and that the source of law may lie in conditions over which society has no control. Further, the courts maintain that necessity has established a rule of action in the acquisition and utilization of water for irrigation, and, at the same time, has eliminated the possibility of retaining the primitive water-right defined by the common law.

Colorado was the first state to incorporate the doctrine of appropriation in its constitutional law. The provisions of the constitution of that state promulgate this doctrine in its generally accepted terms; and the laws of other states and territories, recognizing the principle of the doctrine, are derived from the Colorado law. The sections of the Colorado constitution relating to the subject are as follows:

"The water of every natural stream, not heretofore appropriated, within the State of Colorado, is hereby declared to be the property of the public, and the same is dedicated to the use of the people of the State, subject to appropriation as hereinafter provided.

"The right to divert unappropriated waters of any natural stream for beneficial use shall never be denied. Priority of appropriation shall give the better right as between those using the water for the same purpose; but when the waters of any natural stream are not sufficient for the services of all those desiring to use of the stream, those using the water for domestic purposes shall have the preference over those claiming for any other purpose, and those using the water for agricultural purposes over those using the same for manufacturing purposes."

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[1] Colorado, Idaho, Nevada, Utah, Wyoming, Arizona, and New Mexico.

[2] Kansas, Montana, Nebraska, North Dakota, Oregon, South Dakota, Texas and Washington.

An important tendency in the evolution of the system has been its recognition of different uses to which water may be applied. First, designed to apply only to the gold-placers of the Sierras, the doctrine was soon extended to recognize agricultural and mechanical uses on a par with mining uses. In some states, notably Colorado and Wyoming, social and industrial progress dictated a changed order of importance, and the agricultural use has come to be recognized as most essential and primary. Because of the varying intensity of needs in the different uses, the law is made to meet the order of the uses as well as to recognize the order of appropriation.

The arid states have assumed that water rights find their origin in the scarcity, usefulness, and appropriability of the streams, and that equitable appropriation and utilization requires localized authority in the granting and administering of property in water. They have, therefore, asserted state or public ownership in the streams, recognizing therein a divisible property, and relinquishing the right of appropriation and use to private ownership while the right of control remains to the state.

Optimistic views of the situation in the common-law states would make it appear that the doctrine of riparian rights and the doctrine of appropriation for beneficial use have come to rest amicably side by side; that the two principles underlying property in water are not only non-contradictory, but, in fact, harmonious and supplementary. It is incredible, however, that two doctrines of law having different origins, contradictory objects, and conflicting principles of theory and application should be made to yield to harmonious and supplementary application in establishing security of property in the resources of the same stream. It is likewise to be doubted that the highest possible industrial development may be attained under this dual system. Such incredibility is clearly justified by the stream of water-rights litigation constantly pressing upon the courts of California and such other states as have attempted to emulate her system, when contrasted with the infrequent appeals to the courts of tho Colorado system.

Conflict of private and public interests.

The refinements of national economy and legal theory are of little concern to the homesteader and pioneer irrigator. He has enlisted his savings and his strength against the deprivations and uncertainties of a new country, and, to his way of thinking, right of undisturbed possession should go with the successful appropriation of natural resources as well as with the production of new values. The United States, in its land policy, has logically assumed that a property right in resources, appropriated and reasonably utilized, is little enough reward for the efforts and risk of the appropriator. The first cultivators in the arid valleys of the West endeavored to acquire lands most desirable in surface and soil, and most accessible to a water-supply adequate for their irrigation. Later comers, finding choice lands preëmpted, were obliged to select bench lands farther back, or, in case the adjacent stream was exhausted, they devoted their attention to the rougher lands nearer the headwaters of the stream where the flow could be intercepted before reaching the headgates of the prior appropriators.

Land and water were both available in sufficient quantities to meet the needs of a considerable number of settlers; but the time has passed in every section of irrigated America when the water-supply was sufficient to permit of unrestrained appropriation without the deprivation and threatened depopulation of lands first served by the streams. In this phenomenon appear the conflicting interests of the individual and society, and the necessity for irrigation law. The primary problem in the definition of property rights reveals the necessity for law in the rough—the kind of law is a matter of secondary concern. Where vested interests are not yet created, little injustice may be done by a crude law. What is wanted is a starting point—a primary rule of action. As settlement increases, the primitive laws are refined and augmented to meet considerations of the enlarged and increasingly complex interests involved. In the sphere of American irrigation, we have seen the rule of "possession gives ownership" give way to the dictum "first in time, first in right," later the chief consideration in defining a right emphasized the nature of the use as well as the time of appropriation, and practice now tends to assign

Fig. 61. Scene on a main irrigation ditch, near Placerville, California, forty-two miles from the intake.

first right to the highest use. The rank of uses is determined by their importance in promoting general welfare.

The result of the conflicting private and public interests suggested above has been the initiation of various irrigation policies designed to adjust existing difficulties and to mature into legal and administrative systems that will conserve equitable rights.

When land may be had without price, the interests of the settler are best served by a large farm and extensive cultivation, which, with an increasing population, leads to tenancy and the wage system. The general well-being of both present and future is best assured by encouraging small land holdings and intensive culture, thus securing wider economic independence and a high national productivity. The truth of this assertion is especially patent in irrigated communities where irrigable land is comparatively scarce and its productivity exceptionally high. Government and local policy has been increasingly restrictive in regard to the size of land holdings allowed. Time and conditions have determined the acreage made available, per family, from 640 acres, under the desert claim, to 40 acres, under recent federal reclamation and irrigation district projects.

When fortunately circumstanced settlers are unrestrained in their diversions of water from public streams, their interests are best served by prodigality of use and maximum crops at the expense of lands farther down the stream which are thus deprived of cultivation. Public welfare is best promoted by securing the maximum utility of water and land combined, which means something less than a maximum crop upon the more fortunately situated lands, but a larger net product from all lands. Several states are formulating policies of economic distribution of water. Such policies are in conflict with the primary doctrine of appropriation and require its amendment with regard to the amount of water that can be appropriated per acre of land. The problem is a difficult one. Different climates, different soils, and different crops require different amounts of water, and the allowance for a fair crop under such varying and uncertain conditions may not readily be ascertained. However, some states have already incorporated in their laws specifications as to the maximum amount of water appropriable to an acre of land.

A third question of economic expedience which has given rise to varying policies among the states pertains to the location of the water right. Private interest desires that a right in a stream, once acquired, may be moved up or down the stream or be transferred from one piece of land to another; but others than the owner of the right are concerned with questions of seepage, evaporation, and waste and return waters which may be modified by the manner of its use and transfer. Various policies are being worked out looking to the localization of the water right, and attempts are being made to attach the right to the soil and make its title nontransferable apart from the land and its use nonapplicable to other than specified areas. Economies have recently been undertaken by regulating the time of using water and enforcing coöperation in its use. Such policies involve the practices of *rotation* and *prorating*. Other policies pertain to subjects of irrigation finance, construction and administration.

With the progress of settlement and the development of industry, public economies, once insignificant, become imperative and give rise to administrative policies which may be perpetuated by law or may give way to other policies.

Irrigation legislation.

The duty of the legislator is to formulate law in accord with public policy. Public policy, in so far as irrigation is concerned, tends to promote industry on the arid lands, and at the same time to conserve that security of private property deemed essential to economic independence and individual initiative. In order that such ends shall be achieved, industrial policies and consequent legislation change with the order of social development. This principle of the adaptation of economic policy and law to the state of development has frequently been overlooked in the discussion of prevailing irrigation systems. Primitive pioneer methods in harmony with the development of a new country have been criticized as contrary to the welfare of an advanced industrial state; and, while irrigation institutions are still young, critics would displace them by initiating policies designed to meet the needs of complex industrial society and advanced political ideals. Policies based on theories of immediate or early socialization of resources are at present as ill adapted to the irrigation country as the rough-and-ready criminal procedure of the border to city government; however, each is the product of its environment and, doubtless, best fitted to the exigencies of its own time and place.

The economic policies of a new country are necessarily individualistic and utilitarian. At such times, the welfare of the individual usually means the welfare of society. As population increases and the activities of individuals become the concern of their neighbors, personal considerations become subordinated to social needs, and public policies are readjusted to meet changed conditions. This readjustment demands the sacrifice of privilege to the public good, and in this process is observed the political struggle of favored individuals against the insistent claims of social welfare. As time goes on, progress necessitates the subordination, by law, of private rights to the general interest, and reconstruction of irrigation institutions in accordance with this law of progress is the duty of judges and legislators. The immediate work of the lawmaker is to bring the activities of the individual irrigator into harmony with economic use of the state's resources. The accomplishment of this object entails an understanding of the motives of individuals and of the prevailing and future needs of the public, together with a proper conception of the order of development toward democratic social and economic ideals. Coextensive with the responsibilities of the law maker, are the functions of the educator. If the individual is to sacrifice certain

Plate IX. Domestic bison ranch in South Dakota

privileges for the public good, he must not only understand the justice of the demand, but should also be instructed in the highest use of his remaining facilities. If the irrigator's water right is limited or reduced for the benefit of the downstream settler, a scientific use of that which he continues to receive under the right may be made to serve the former objects of a larger supply.

The irrigation problems of the lawmaker refer to the nature of the water right and the manner of its administration, and expanding law should incorporate progressive interpretation of the first and increasing elaboration of the second. The nature of the right is of chief concern. Efficiency of administration is of immediate and increasing importance, but administratve systems are easily changed and improved, while principles of property rights are apt to become so confined in the legal texture as to be difficult of abrogation or amendment. While it is true that the concept of property in water for irrigation has been readily modified with the progressive needs of the industry, the possibility remains that the nature of the right may become so inflexible as to jeopardize the industrial future of the irrigation states.

Irrigation finance.

Irrigation finance includes the aquisition and expenditure of means for the construction and maintenance of irrigation works, and their operation in the distribution of water.

Problems of finance increase in complexity and magnitude as settlement moves back from the streams, and the necessities of wide distribution and careful utilization of water command extensive canal and reservoir systems. Plans of irrigation finance may be classified as *private* or *public*, or, from a second point of view, as *independent* or *coöperative*.

At the time when an adequate water-supply was easily accessible, individual settlers were able by their own efforts to open waterways sufficient to irrigate their lands. In most cases, however, early settlements were made in colonies and the usual plan was the employment of coöperative labor in opening a main canal sufficient for the common supply. Each farmer assisted with labor and teams in carrying the canal from the stream to his own headgate and, thereafter, constructed his own laterals. Improvements and the general upkeep of the canal was a joint obligation. A later development of the same plan placed a proportional assessment upon the beneficiaries of the project, the assessment being payable at their option in cash or labor. The most extensive application of this early scheme of coöperative construction was successfully undertaken by the Mormons in Utah. The signal success of the Utah colony may be partly attributed to the fact that the stimulus of individual benefit was accentuated by the prevalence of church authority. The colonists at Greeley, Colorado, in 1870, supplemented their coöperative labor with a considerable capital expenditure and created an extensive and efficient system.

Individual enterprise and private coöperation were, however, soon inadequate to finance and direct progressive irrigation projects. Although these primitive methods still persist, the field of irrigation finance was dominated about 1880 by the investment company. The plan of the earlier companies was to acquire, by purchase or appropriation, a water right sufficient to supply a designated area of land. Frequently the land was also acquired by the company, but more often remained in the hands of individual owners. Sufficient stock was subscribed to build the works, and the water was sold to the tributary farmers at an annual rate or "rental." If the company owned the land, upon the completion of the works, the underlying areas were divided into farms and sold, the purchaser being dependent upon the company for future water service.

The investment company occupies a normal position in the order of irrigation development, since the necessary resources for large undertakings could be accumulated only through the corporate forms of financiering. Despite this fact, the investment company has become a menace to progress in the sphere of irrigation. When a water user is dependent upon a corporation for his supply, and subject to an arbitrary rental, his prospects are mortgaged to a monopoly of most favored position. A company, having a perpetual water right upon which an area of land is entirely dependent, has a virtual title in the land, and by charging what it pleases for water, the company may absorb whatever net product may be yielded by the land. Fortunately, the class of farmer prevalent in the West has not readily lent himself to this form of exploitation, and fear of high-handed retaliation has been a potent factor in restraining the conduct of favorably situated companies. Many states have appreciated the danger of the monopoly element in the investment company, and have forbidden such companies to raise their rates, or have taken a hand in fixing the rates. This restriction, together with unexpected costs of construction and operation, has made the securities of irrigation and water companies unpopular among investors. At the present time, few new companies are being organized, and many old companies have been reorganized on a mutual basis and the stock passed over to the owners of the land using the water.

The most popular scheme of irrigation finance thus far extensively used, and to which the investment company is giving way, is that employing a temporary investment company for construction, which, thereafter, transfers its stock to the water users, who continue the enterprise as a mutual company. The original company acquires water rights, and, frequently, the lands to be served by the projected system. Subscribed capital is used to convey the water to the land, and the company contracts to deliver to the land-owner a perpetual water right of specified volume, together with a proportional interest in the system, for a lump sum. If the land reclaimed is owned by the construction company, the contract price will include a farm with the water right. Easy payments, covering periods of several years, are the rule. The system is usually operated by the company until its entire capacity is subscribed, and entirely or largely paid for, when a reorganization of the corporation transfers the entire enterprise to the water users. The advantages of this plan of finance, both to the investor and the irrigator, are many and obvious.

Notwithstanding the advantages of the plan just described, it is not without serious defects. The opportunity for large gains on the part of promoters has incited considerable speculation and has led to many unsound enterprises. Adequate water-supply is fundamental in the success of any irrigation venture, but many projects have been carried to completion only to find their canals unfed and their lands worthless. In such cases, the burden of the error can seldom be shifted to the promoter or to "innocent" land purchasers, and the security holder must bear the loss. Undertakings of reclamation companies, although usually sound, are now viewed with more or less distrust.

In addition to the above defect, the resort to bond issues, so general among large industrial corporations, is unavailing in the case of irrigation companies. The limited liability of stock-holders and the useless nature of the assets of an unsuccessful or incomplete undertaking do not appeal to the conservative investor as reliable bond security. Furthermore, the short life of the construction company, the magnitude of the funds required, and the usual ignorance of capitalists as to the essentials of a successful project, are obvious obstacles to stock subscriptions. In view of these inherent defects and the fact that few undertakings can now be financed for less than hundreds of thousands or constructed without years of labor, it appears that the investment company has outlived its greatest efficiency as a means of irrigation finance.

The irrigation district plan is now coming into prominence as a solution for the difficulties enumerated above. The plan seeks to retain the principle of coöperative maintenance and control of irrigation works and to remove the disability of limited liability and speculative corporation methods, thus insuring a means of construction by borrowed funds and a repayment of the loan from the earnings of the plant. The district plan was instituted in a crude form by the Utah settlers as early as 1860, was incorporated in the Wright Law of California in 1887, and has since been improved and authorized in most irrigation states. It not only presents an attractive scheme of finance, but also engages to reconcile the principles of irrigation economy with the riparian doctrines maintained by the common-law states.

Irrigation districts may be initiated by either of two plans. By the first plan, freeholders under the proposed project may pool their vested water rights (rights may be either riparian or those acquired by appropriation) in the specified source of supply, or they may purchase an available supply from owners up or down stream, or upon another stream which may be diverted to their needs. A first lien upon the freeholds to be benefited becomes security for an issue of irrigation district bonds the proceeds of which are used for purposes of construction. The water users of the district are liable to a proportional tax for the payment of principal and interest on the bonds, which usually mature in periods of from five to twenty years. Thereafter, the district is perpetuated as a mutual enterprise, but may receive administrative assistance from the state or county.

The second district plan provides for cases in which the lands to be irrigated are not at the time of reclamation occupied or improved and, therefore, not good security for a bond issue. Such a plan is contemplated by the Carey Act of 1902. An investment corporation is first formed to acquire the land and thereafter dispose of it to settlers. When all the land with perpetual water rights is contracted to cultivators, bonds are sold for the construction of the works. Bond-holders are secured by first liens upon the lands to be irrigated and upon the property and stock of the construction company. The purchasers of land bind themselves to pay for their farms within ten or more years and, meanwhile, to sustain a tax sufficient to defray the interest on the bonds until their maturity. When the bonds are liquidated, the construction company passes out of existence and the system becomes the mutual property of the irrigators of the district. Irrigation district bonds have not always found a ready market and many worthy enterprizes, because of their magnitude, have remained without hope of successful culmination. The realization of this situation led to the passage of the National Irrigation Act of 1892. By this law, government and private coöperation are united in the field of irrigation finance. The government assumes the rôle of the investment company in the district plan last described, and government funds replace the capital accumulated by the sale of bonds. The law provides that receipts from the sale of public lands within the several states may be advanced, without interest, for the construction of irrigation works within those states. Agents of the government assume the duties of passing upon the advisability of the project, segregating the lands to be benefited, disposing of public lands and of water rights to settlers, at prices estimated to cover the cost of construction, and undertake the actual construction of the works and delivery of the water to the headgate of the user. The area of land to be owned by one family is strictly limited. The purchase price is not required until the works are complete and the land is under cultivation. Thereafter, ten to twenty years are allowed for the complete restitution of the government loan, and the system passes under the control of a water-users' association, similar in its organization and administration to the irrigation district and thereafter into the possession of a bona-fide irrigation district.

There is little doubt that American economic ideals are best served by coöperation between public and private agencies in financing large irrigation enterprises. The time may again come when government assistance will be unnecessary, but the large capital and weak investment security now incident to many reclamation projects place them clearly without the sphere of private finance. It is within the power of the government, in advancing the capital and directing its expenditure, to require fundamentally sound security and to make that security good by carrying the project to completion. However one may judge exploitation and speculation, in their general aspects, they are to be emphatically condemned when they threaten the welfare of the nation's home-builders. These dangers are eliminated from the field of irrigation finance when the general government assumes the functions of engineer and builder, and the duties of maintenance and administration are remanded to local authority and private enterprise.

Questions of private and public ownenship of irrigation works are too onerous for treatment here; suffice it to say that neither experience at home and abroad nor arguments thus far advanced are sufficient to discredit the American economic ideal of private ownership in natural resources pertaining to agriculture.

Socio-economic Aspects of Irrigation.

By *R. H. Hess.*

An irrigation economy creates conditions peculiarly favorable to coöperative production. This fact is patent when it is observed that the coöperative colonies of Utah, Colorado and California proved the most successful ventures of the kind ever undertaken, and that coöperation is becoming apparent as an attribute of almost every line of extractive industry upon irrigated land. Canal and reservoir companies, fruit- and honey-producing and shipping associations, canning factories, sugar-beet producers' associations, and cattle and sheep men's associations—all organized upon a purely coöperative basis—prevail in the irrigated country. These organizations are very seldom designed as industrial "fighting machines," and they have no intention of creating producers' or consumers' monopolies; but, on the other hand, they offer a healthy stimulant to individual enterprise and sectional competition in production.

Coöperation.

Coöperation is a means for eliminating friction in production and increasing economic efficiency, and, while itself a type of industrial dependence, is a means to economic independence of the highest order. Coöperative activity can thrive only in an atmosphere of community interest and social confidence, and can attain maturity only by a coextensive development of intellectual and administrative ability.

The personnel of the early settlements of the West was quite unsuited to successful coöperation, but the lack of capital and the pressure of necessity subordinated individualistic desire to coöperative labor for subsistence. United and long continued effort was necessary to break out waterways sufficient for the irrigation of even small settlements, and coöperative construction, maintenance, and use of irrigation works has remained customary from the beginning. Neighborhood interest in the common water-supply is a primary fact of an irrigation economy, and community dependence and coöperative endeavor in the distribution and use of water are characteristic irrigation institutions. The administration of extensive irrigation systems and the distribution and use of a limited and very valuable water-supply tend, not only to develop a scientific technique of irrigation, but also to bring about a common knowledge of the fundamentals of law and public policy which underlie individual and social welfare. The successive phases of the irrigation industry have already exemplified coöperative labor, coöperative financiering, and coöperative administration in neighborhood enterprises; but the principle of coöperation is surviving a period of consolidation of neighborhood works which means, ultimately, a centralized management of the entire irrigating system of every valley or area drawing its water-supply from the same source. Such a system will include, in most cases, a vast network of natural channels, canals, laterals, and reservoirs for the diversion, impounding, and distribution of the total flow (including flood and winter waters) of an entire stream. In this movement, the irrigation district, with its referendum vote, is becoming the dominant form of organization.

The normal and inevitable coöperation, under an irrigation economy which is not subject to government administration, is not inimical to legitimate competition. The coöperative functions need extend only to the administration and utilization of the public water-supply and the marketing of the product of the soil. In this sphere, the identity of the individual and community interests is clearly apparent; but the spheres of private property and private initiative in production are not seriously invaded, and the benefits of competition are preserved and, in some cases, even heightened.

It would be strange, indeed, had the economic conditions making for coöperation not developed noticeable social and individual characteristics. Sectional independence and mutual confidence and dependence within the community are already quite apparent. In this tendency is a positive security against the much-talked-of and little-feared monopoly control of the water-supply. The would-be monopolist has already fared badly at the hands of the irrigator whom he had hoped to exploit, and promoters are rapidly turning their tangible interests over to farmers' coöperative companies at a fraction of their investment values. Permanent investment companies are now very generally discredited, and the investment feature of irrigation enterprise has come to extend only to the construction of works and the disposition of lands reclaimed.

The development of a high order of intellectual and administrative ability, which is the inevitable outcome of a generation of coöperation in irrigation production, will doubtless react upon governmental institutions, and the gift of prophecy is not necessary to foresee radical changes in the political life of the West.

The small-farm unit.

The most scientific distribution and application of the water-supply of the arid country will permit of the tillage of only a small fraction of the available land. The tendency, therefore, is to cultivate only the best land and to economize in the use of the scanty water-supply. Intensive tillage not only increases the product upon land adequately supplied with water, but may be made to compensate for an inadequate water right upon land less fortunately circumstanced. The latter fact results from the conservation of the natural moisture, as well as artificially applied waters, by what is generally known as a system of "dry farming." We have, therefore, two clearly marked phenomena of progressive irrigation agriculture, viz., (*a*) an intensified use of the arable lands, and (*b*) a rapidly increasing cost of additional water-supply and rising values of earlier appropriations. Where the law makes the water right an appurtenance to the land, the augmenting water values will inhere in the land; otherwise they will attach to the water right and may be transferred apart from the land. The difficulty of financing extensive agricultural operations under such conditions, especially where labor is scarce and the tenancy system not in vogue, is at once apparent, and it is clear that a small-farm unit intensively cultivated by the owner is the logical development.

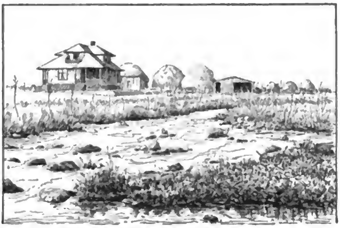
Fig. 62. A property developed under irrigation. The home of J. A. McPherson, Director of the Experiment Station, Twin Falls, Idaho. Photograph taken two years after the land was entered under the Carey Act.

Irrigation agriculture is characterized by a considerable choice of rich lands, by a superabundance of sunshine, and by a precise adjustment of moisture to the best conditions of the growth and harvesting of the crop. Such conditions result in an extraordinarily large product per acre, and usually produce a high quality of commodity as well. In the older irrigated regions, annual water rentals of two to five dollars and net crop values of twenty-five to seventy-five dollars, per acre, are the rule, and not infrequently the values are tenfold.

Bonanza farms still exist in many sections of the West, but, in spite of the love for expansive industry which clings to the frontiersman, another decade will witness their extinction in all sections where intensive farming is not prohibited by climatic conditions of aridity or altitude. The farm unit of Utah has always been twenty to forty acres, and is now being reduced. The fruit sections of California and Colorado have reduced their individual holdings to five to ten acres. The cattle kings have been driven from the arable lands of the Rocky Mountain states that quarter-section farms may be devoted to general farming, and these, in turn, are being subdivided for a more intensive use in specialized production. Likewise, the wheat barons of California are rapidly receding from the advance of the irrigating ditch and the small farmer.

The above manifestations are being accompanied by an era of experimentation and instruction in irrigation agriculture. The United States Department of Agriculture and the state agricultural colleges and experiment stations are rapidly developing and introducing new crops and scientific and economical methods of tillage and irrigation. (Fig. 62.) The wide adaptability and high productivity of the plains soils is being revealed, and prodigality in the application of valuable water to crops is being eliminated. The possibilities of intensive cultivation where irrigation is in vogue are already so well understood that the system is becoming general, and it is not unusual for the gross value of irrigated crops to exceed 100 per cent of the commercial value of the land.

Specialized cropping.

Irrigation farming is unique in its adaptability to specialization. As noted above, the superabundance of land is such as to make possible the selection of superior qualities for cultivation, and, the peculiarities of the soil being determined, crops may be selected to best suit these characteristics. This is possible in irrigation farming because matters of slope, drainage, and natural moisture of the soil are largely immaterial—the water-supply, both as respects time and amount, being under the absolute control of the irrigator. In other words, having given qualities of soil highly fitted for selected crops, growing and harvesting conditions can be adapted, within wide limits, to the needs of the crop selected—the farmer essentially makes his own weather. Such fortunate circumstances are unknown to humid agriculture and result in a diversity of production in harmony with diversity of soils, an unusually high quality of product, and an exceptional yield.

Attention to specialized farming is producing seemingly fabulous results in the western states and territories. Most sections are fortunate in some peculiarity of soil and excel in the production of one or more commodities. Thus, there are the grapes and citrus fruits of California, the apples of Oregon and Idaho, and the potatoes and cantaloupes of Colorado. (Fig. 63.) Within single states, we find equally marked specialization among sections, and every American market knows the quality, *par excellence*, of the potato of the Cache la Poudre, the melon of the Arkansas, and the peach of the Grand Valley,—all in Colorado. It is not to be supposed that sections of the irrigated country given over to specialized production are not adaptable to the methods and crops of general farming in vogue in more humid states. In fact, specialization is rather a new departure, and general farming of a high order has been the rule and is still widely practiced, especially in the newer sections of the irrigated lands.

Certain problems of specialized cropping grow out of the difficulty of securing a stable market. Specializing districts are dependent upon the sale of their products that they may purchase the necessities of living, while the diversified producer is largely self-sustaining and independent of the market. The scanty population of the West denies adequate local markets for heavy special crops, and the farmer must not only command an eastern market by the superior quality of his product but must meet heavy and frequently discriminating freight rates, undertake risk in the transportation of perishable commodities, and chance a highly speculative market subject perhaps to the manipulation of his eastern competitors. Because of this element of uncertain market conditions, many westeners advocate and practice diversified farming who will turn to the specialized system as soon as the speculative market is eliminated. This movement is being accelerated by the suppression of speculation on the commodity exchanges, by improvements in transportation, by the regulation and reduction of railway tariffs, and by a growing demand for known varieties of western products.

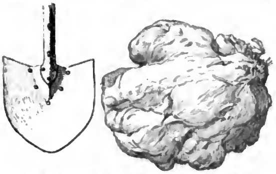

Fig. 63. **Reward of irrigation.** Sweet-potato, wieght 42½ pounds, grown on irrigated land in Yuma, Arizona.

The problem of rotation of crops and the conservation of the soil under the specialization system of cropping does not seem to be a serious one in the arid country. It is true that repeated cropping to wheat, under the old ranching system, has weakened much of California's best land; but such soils were neither irrigated nor considered worth preserving. Under modern methods, at least a two-field system of crop-rotation is usually maintained, in which alfalfa appears as a nitrogenizing agent of exceptional value. The irrigated lands are surrounded by vast areas of range or natural pasture lands and stock-raising persists everywhere. The range lands are sufficient for the summer feeding of many cattle and sheep, and the three cuttings of alfalfa acquire a high value for winter feeding and the preparation of stock for the block. Thus, a profitable rotation is possible and considerable fertilizer is available when desired.

Social tendencies.

The coöperative functions necessary to the successful organization and administration of extensive irrigating systems, together with the study and experimentation incident to specialized and intensive agriculture, should develop an intellectual and highly efficient type of farmer. An acquaintance among farmers of the older and successful sections of the irrigated country will confirm this conclusion. Where irrigation farming is specialized and intensive, and it is all rapidly becoming so, there is evidence of increasing thrift and intellectuality on every side. The unusual *per capita* expenditure for public education in most of the western states, the universal use of the telephone and the daily paper, the advance of the good-roads movement, the number of western farmer boys in eastern colleges and universities, and the numerous university graduates on western farms bear witness to this assertion. The artistic farm residences of southern California, and the habits of travel and comparative luxury of western farmers are of frequent remark. The scarcity of farm mortgages and the comparative absence of tenancy in the West, together with the high financial rating of the established class of irrigators, evidence a somewhat superior type in the arid-land farmer. In fact, the commercial farmer predominates under an irrigation economy, and conditions which there obtain are forcing the profession to a plane to which the inefficient and mediocre cultivator can scarcely hope to attain. Indeed, advanced cultivation and consequent increase in land values, have recently dispossessed many marginal holders and sent them back to the "river" or on to the new lands of the Northwest.

It has been observed that the tendency in agricultural communities is for the most efficient farmers to become possessors of the better lands. The existence of entailed estates and the recognition of customs which make the agricultural population more or less immobile are in conflict with this tendency, and in some countries seem to nullify it entirely. But the West is exceptionally free from traditional and legal hindrances to the normal movements of population and industry, and the dominance of the efficient farmer seems assured.

A tendency, perhaps less marked than others, but nevertheless quite certain, is for irrigation farmers to reside in villages and enjoy the consequent advantages of town life. The movement in this direction is coextensive with the reduction of the farm unit and the progress of intensive culture, and is also a natural product of coöperative irrigation and crop marketing. In Utah, the agricultural village, with its outlying fields and numerous coöperative enterprises, is an old institution. Greeley, Colorado, with its Farmers' Club and unexcelled public school system, is a pure product of agricultural village life and is now taking on the varified commercial aspects of maturity. Riverside, California, is an unalloyed example of community interests and coöperation characteristic of a mature irrigation economy. Its magnificent homes and shady streets are said to be surpassed by few city districts of equal area in the world. Each resident is the owner and cultivator of a small farm adjacent to the village. Servile labor is in slight demand, and the village dwellers enjoy the domestic, educational, and social advantages of the city, together with the hygienic and economic values of country life. It is asserted that labor difficulties, even that of domestic help, are unknown in Riverside, and that no asset of city or country life is beyond the means of its residents.

Some writers have designated irrigation as a potent factor tending to the socialization of the industries and resources of the West. In so far as the coöperative distribution of a public water-supply means the socialization of natural resources, and in so far as coöperative action among producers in securing a common market for their product means socialized industry, the assertion is true. But these activities fall far short of demonstrating any effective tendency toward the socialization of either resources or industries of the irrigation country. In fact, the benefits of private property and individual initiative in industry are nowhere more widely distributed or more universally asserted than in arid America. The West has always been extremely individualistic, and the conditions of water distribution and specialized farming offer no material innovation in this respect. The coöperative activities are purely subservient to the business organization of a new agriculture, and the tenets of business are scarcely socialistic. On the other hand, competitive forces, operating through scientific production and economy of resources, and commanding unusual intellectual ability and administrative training, make for a kind of commercial agriculture of very superior attributes.

CHAPTER V

LAND AND LABOR

EQUITABLE PARTITION OF LAND is the necessary basis of all self-sustaining agriculture. This partition and use of land may be in the form of ownership or in the form of right to hold the land for a specified time. The ownership may be of different degrees: The owner may have unlimited right to sell and to bequeath, or he may be bound by certain statutory restrictions. Likewise, the rental of land may be of different degrees and kinds, and in some cases it may amount to practical ownership. These varying forms of land partition have arisen with the evolution of society.

Having secured a definite part of the surface of the earth as his base of operations, the farmer applies labor to his land. This labor may be his own, or he may purchase it. The mode of purchase is of three main kinds: Direct hire for cash or the equivalent of cash; employment on stated shares, in which the laborer partakes in the risk of the crop; proportional division of the total profits of the business. The supply of labor for farm use is conditioned on the general economic and commercial status of the given time. Great extension of general commercial activities demands increased numbers of laborers and tends to draw them from the farms because it offers them greater rewards or greater attractions. We have been living in such an epoch for the past twenty-five years or more, and the discussion of the "farm labor question" is now uppermost in the public mind. This question is not peculiar to North America. It obtains wherever the modern commercial impulse has reached. Nor is the scarcity of labor peculiar to agriculture. Commercial interests compete among themselves, and they all feel a shortage in varying degrees. The present solution of the farm labor problem seems to be to try to secure laborers from other occupations or from foreign countries by offering them greater inducements. The real solution is for farmers to train farm artisans from their own class or group as purposefully as shop men and factory men train their artisans. We really have no farm artisan group, nor do we seem to have taken any means to develop one. Agriculture should be as self-sustaining in respect to its labor as in respect to the fertility of its land. It can develop this self-sustenance when each farm becomes good enough, and its operations continuous enough, to constitute a school for the training of men; such a farm will not only train the men, but it will attract the men and the youth to remain in the first place. Any policy that depends on the attracting to the farms for a part of the year of men from other places or employments and of no class pride in farm work as an occupation, is only a temporizing effort.

Land and labor when properly applied produce wealth. This wealth, or the land-basis on which it rests, becomes one of the means of support of the society organization or government. We therefore come at once into the realm of land taxation.

THE OWNERSHIP IN LAND

By *J. L. Coulter*

When we speak of a piece of land, we mean a well-defined area of the surface of the earth; this includes the soil and whatever is erected upon its surface or buried beneath it. In theory, it extends indefinitely upwards and downwards. Under the doctrine of accession, buildings are included as a part; under the doctrine of acquisition by production, the trees and other things growing upon the land are included; minerals growing beneath the surface are also included.

Ownership.

Before we can have any transfers of land we must have ownership in the land. This ownership must consist in the right of possession of the land and the right of enjoyment, and must extend over an indefinite period of time. Having a title to land, this title, with all of the rights attached to it, may be disposed of or transferred to another party.

At the beginning of human history, men did not claim ownership in land. They roamed over its surface and obtained a living as best they could, from berries, fruits, nuts, and roots, and from hunting and from fishing. Every man helped himself to whatever he wanted, provided he was able to get it. In order to preserve life, the weak would often have to place themselves under the protection of strong leaders, if the supply of necessary food was limited. Leaders were probably glad to protect those who would slave for them. Then, too, the rearing of the young compelled a more or less permanent settlement where protection from enemies,—man or beast,—was more certain.

As time went on and population increased, the struggle for existence forced men to hunt in bands; and the consciousness "of kin and of kind" drew them together. They learned to control members of the animal kingdom, became herdsmen, and in time began to till the soil. We now come to the point when people laid claim to the land.

Early forms of landownership.

It may be that they settled down in family groups, held the land in common and, working together, tilled whatever was necessary for the common good. On the contrary, it may have been a form of early slavery in which the land was held by tribes and large areas were seized, defended and tilled—under the mastery of despots and tyrants—by the weak, who had practically become slaves. Probably some areas were held one way and some another; or a combination not all bad or all good may have been the primitive form of holding lands. Outside of civilized countries, even today, the land is held by savage tribes, communal families, feudal lords, or men under despots.

It will be enough to note that prowess in war, custom and family ties are the great controlling forces during this period of possession of the land. The chief has a right to the land that he conquers and defends against opposing forces; and he has a right to levy tribute on those whom he protects. Primitive custom also recognized certain rights of the tiller of the soil, in and over the land. The land, rescued from the wild state and cultivated, was considered a part of the family holding. But up to this time private ownership, as we understand it today, was not known. Before we could be secure in the right to possess land, enjoy the use of it, pass it on to another person or claim title over an indefinite period, we had to have a strong government.

Private ownership and transfer in ancient times.

With the rise of government and the state, the importance of the family unit is decreased. Now, the head of the family comes into a position of real ownership. He is protected in his acts by the state. He not only has possession of the lands and enjoys the use of them, but when he dies, the title is passed on to another. He may sell his right to the lands, give it away to members of his family or mortgage it, or he may will it to another at the time of his death. In the twenty-third chapter of Genesis we read how Abraham bought a piece of land as a burial ground, for four hundred shekels of silver.

Greece and Rome, as nations, conquered land and parceled it out to settlers in much the same way as the United States forced the Indians from the land and sold it, except that these countries made slaves of the people they conquered. This was over twenty centuries ago.

Feudal ownership.

Conquering tribes at last overpowered the great Roman empire. They seized all the land as they went along, and engrossed it in their various kingdoms. The chief of each small kingdom was lord paramount; in him rested the absolute right of property. He granted great estates to his leaders, called barons, and they, in turn, served him, supplying him with troops in time of war, and with the means of living. These barons again parceled out the land granted to them and, in turn, secured military or other service from their vassals. These, again, might subdivide their holdings.

But, under the feudal system, all of the land was, at first, held from a higher power. The person could occupy the land and enjoy the use of it, but he could not pass it on to his family or sell it. If he failed to perform the required military service, or other duties, he was driven from the land. As time went on, a piece of land would be granted to a man and his sons, and, when the man died, the sons held the land and performed the services. Later, the grant was to a man and his heirs, and thus passed down from father to son, to grandson, and to other descendants. Here, then, we have a new development in the transfer in land.

But even though the right to possess and enjoy the use of the land passed on from one to the other down through generations, the man who held it could not sell it. If he had been given that right, he might sell to some enemy of his lord. But at times the lord would place personal confidence in the vassal and allow him to dispose of his right of possession. This practice grew, and at last the right to transfer the land came to be recognized by law. This was at the end of the thirteenth century.

Primogeniture.

According to the law of the later feudal times, if a man died without a will, all the land was inherited by the oldest son; this was the law of primogeniture.

In England.—At a later period, he might divide his estate if he wished, but the practice of the times was to preserve the great estates from generation to generation, and pass down the names of the great families. Thus, even if the rest of the children were left beggars, the estate and name were saved. For the same reasons, large estates were seldom sold, and small holdings were gradually passed into the hands of the greater landowners. The conditions in Great Britain today,—the fact that nearly all of the land is in the hands of a few and cultivated by tenants,—are largely the result of the restrictions placed by custom and law on the right to pass land freely from one to another, whether by will, or by purchase and sale.

In France.—Although this system formerly prevailed, the laws now permit easy sale and purchase, and require dividing of landed estates at time of death. And, if no will is made, all land is divided equally among the children. The result has been that, instead of a few noblemen owning nearly all of the land, eight out of ten farmers cultivate their own land. This system of minute division of lands is criticised as going to the opposite extreme, inasmuch as many farms are subdivided into such small pieces that they cannot be as profitably operated as larger farms, and in many cases are not large enough to support a farmer and his family.

Title to land in the United States.

Wherever Englishmen have discovered land they have claimed it for the Crown. The government has, in turn, assigned it to private persons or corporations for the most part in "fee simple." By an estate in fee simple, we mean a title giving the rights of possession, enjoyment and disposition, of a piece of land. The title is also of indefinite duration. But it is not absolute. An estate in land is, in this country, and has been in the civilized world for centuries, subject to the right of the state to change it by limiting it or broadening it and by appropriating it to its own use or for the public good. The various states of the United States decide for themselves, through their legislatures, in what ways they shall limit private property in land.

American colonies.—During the colonial period, the owner of land could sell it, or leave it to friends or relatives by drawing up a will. If he did not make a will, the land would all go to the oldest son, in some colonies, as in England. In some colonies, twice as much land went to the oldest son as to any of the others. In other colonies, each child got an equal share. After the United States was formed as a separate nation, the states that had the law of primogeniture abandoned it, and now, if no will is left, each child gets the same amount of the parents' property. If one of the children is dead, the grandchildren will get the share that would have gone to their parent.

If the landowner wishes, he may leave a will. This is a written statement telling how he wishes to have his property divided. The state in which the land is situated undertakes to see that the transfer in property is made according to the wishes of the deceased. Here, again, we see that the state assists rather than in any way impedes the easy transfer of land from one person to others, whether they be descendants or other parties. All devises are governed by the law of the state in which the land is located, and not that of the place where the man resided, where he died or where he drew up the will.

Land policy of the United States.

When the United States became a nation, it acknowledged the disposition of land that had been made up to that time, by declaring that all citizens would be protected in their right to own property. Most of the public lands (except in the case of Texas) now included in the United States passed into the hands of the national government. Most of this has been parceled out to private citizens or corporations under grants for education, canals or railroads or bounties to Indians or soldiers, or to farmers under the preëmption, homestead or other general laws. The laws of the United States, and of the states, have been such as to make the buying and selling of land as easy as possible.

Difficulties in present system of transfer.

It is said that in the United States we have free trade in land. It can be bought and sold at will. But there are certain weaknesses in the system even today. No institution is absolutely perfect, and the system of transferring title to lands, in most of the states of the United States, is far from perfect. In most of the states, after an agreement has been made for the purchase and sale of a piece of land, the purchaser must carefully inquire into the title he is to receive. There are many formalities and technicalities, a failure to observe any one of which may defeat title. Even when these have been most carefully complied with, and when the title has been traced to its sources, the purchaser must buy at his peril, there always being, in spite of the utmost care and expenditure, the possibility that the title may be defective.

Recording of deeds.

The system of recording or registering of deeds is in use in France, Belgium, Italy, Spain, the South American republics, Scotland, parts of England and some of her colonies and some other parts of the world, besides in most of the states of the United States. We may here briefly describe the method of recording as in general use.

Assume that a man has a deed to a piece of land that has become very valuable; he makes an agreement with a prospective purchaser to sell him the land and offers to transfer the deed as evidence of title. In order to be secure in his purchase and to be sure that he is not the victim of a land-shark, the prospective purchaser must have the description of the land traced through the records to see that it really is the land he is buying that is described. This may have to be traced back to the original survey, or a new survey made at great expense. A mistake of a yard on Wall street or Michigan avenue might make a man a pauper.

After ascertaining that the description is accurate, an "Abstract of Title" must be prepared, in which every change in title and every mortgage or other claim against the land, must be examined and recorded and a perfect chain of title from the original grant of the government to the then owner, must be traced, unless a statute of limitations shortens the period. The records in the office of the clerk of court must then be examined, to see whether any judgments are recorded there against the owner, or whether any suits are pending that can affect the title to the land. The treasurer's books must also be examined, to see whether or not there are any taxes left unpaid. If the purchaser is finally satisfied, he pays his money and gets the deed.

But the deed is merely a written contract to which the state affixes its seal, offered by one party and accepted by another. It is only an evidence of title. The owner now has this deed recorded; this accomplishes nothing between the two parties. It only publishes to the world that such a deed exists. This being so, the prospective purchaser, fearing that he may not be able to understand the record books, and knowing that he would not be able to trace the chain of title through, usually hires an agent, called an abstractor, whose business it is to prepare the abstract of title.

When all of the past transactions are recorded in this abstract, it often takes the form of a huge volume with page after page of transfers recorded The cost of preparing it has been great, and yet it is of no value as an evidence of title. It is merely a connected list of transfers for convenient reference of the purchaser. But generally the prospective purchaser, unfamiliar with legal methods, does not understand any part of this abstract. Therefore, he must submit it to a lawyer for examination and pay him for his opinion as to the soundness of title. If he buys, he then has his deed recorded, adding his link to the already long chain, and thus publishes to the world that he has the deed. A later examination in a law court may show that the abstract, the attorney's opinion and even the records were erroneous. The older the country becomes, the longer grows the chain, and the more complex the situation. The result has been that in some of our cities the cost of examining titles has become greater than the value of the property.

A small piece of property has as long a title as a large one, and the difficulty increases so that the cost of buying small areas is becoming prohibitive. At the time of each transfer, a complete examination is made, because the purchaser does not know how authentic is the claim of the seller. Thus it is that a system of recording which was once the best in the world, has been outgrown, and better methods are coming into use. A movement to improve the system has been under way in various states of the United States for something over ten years—since about 1895.

Registration of title.

A system of registering titles, as opposed to deeds, has grown in favor. It is in use in Germany, Austria, Hungary, most of the provinces of Canada, parts of England and Switzerland, Australia, Tunis and some of the states of the United States, as well as Hawaii and the Philippine Islands. The system, in brief, is as given below.

At the time that a piece of land is to pass into new hands, by descent or purchase, a thorough examination of the chain of titles from the government to the then owner is made under the direction of a competent government official. This examination has the weight of state authority back of it and the state guarantees its correctness as against the world. Absolute title is then decreed and registered, always subject to the rights of the state, taxation, eminent domain, police power, and the like. A certificate showing (*a*) the owners and all other parties interested; (*b*) an accurate description of the property, and (*c*) all incumbrances, would be registered and a copy given to the owner. Fees would be charged as at the present time. Part of the money would be placed in an indemnity fund to insure against loss, as at the present time in the case of national bank notes. Any person who is injured as a result of any registration would be compensated from this fund, and a title to land would be as secure as the government could make it.

The system described above has been suggested as an improvement, for the following reasons: (1) It is less expensive, inasmuch as only one examination is necessary; this is made by an agent of the state, and the title is then registered. (2) It can be more quickly made; after the first registration, there are no long searches of records. (3) It is more secure; the state makes the examination, registers and insures the titles. No person can go back of the decision of the state. (4) It is simple, and any citizen can go to the records, and understand by reading a few words just what the condition of the title is. Other related reasons are also given, but cannot be discussed at length here.

The system described here has had nearly a century of experience in parts of Germany, and has succeeded remarkably well in Canada, Australia, and other countries. It has been in use in Massachusetts and parts of Illinois since 1897, in several counties in Minnesota since 1901, in the Philippine Islands since 1901, and in Hawaii since 1905. The states of California, Oregon and Colorado also have laws, but they are not in general operation.

Where the system of registration of titles is in general use, it is pointed out that it facilitates transfers in land on account of the greater ease, rapidity, cheapness, and security that it gives. The last twelve or fifteen years (since about 1895) has seen great activity among legislative bodies in this country, and, at this time (1908) many investigations of the merits of the two systems are being carried on. The movement for many centuries among our forefathers has been to remove one obstacle after another which tends to obstruct free dealing in land.

Literature.

Tiedeman, Real Property Law; Washburn, The Law of Real Property; Fustel de Coulanges, Origin of Property in Land; Sir Henry Sumner Maine, Ancient Law; Palgrave, Dictionary of Political Economy; Bliss, Encyclopedia of Social Reform; Jacques Dumas, Registering Title to Land; W. C. Niblack, The Torrens System: Its Cost and Complexity; T. Sheldon, Land Registration in Illinois, with General Reference to Results in Other Countries and States.

LANDOWNERSHIP AND TENANCY

By *H. C. Taylor*

In Great Britain, farms are almost invariably leased. In France and Germany, on the other hand, landowning farmers are the rule. In France, 77.6 per cent and in Germany 83.6 per cent of the farmers own all or a part of their farms. With these percentages for France and Germany, it is rather surprising to find that in a new country like the United States, where, until recently, any one with a very small amount of money could secure a good farm from the Government, 35.3 per cent of the farmers are tenants.

Statistics.

The following table shows the percentage of all farms that were operated by the different classes of farmers in the United States and in the geographic division of the country in 1900:

TENANCY AND LANDOWNERSHIP IN THE UNITED STATES IN 1900.

	Owners	Part owners	Owners and tenants	Managers	Cash tenants	Share tenants
United States	54.9	7.9	.9	1.0	13.1	22.2
Geographic divisions:						
North Atlantic	72.3	4.0	.9	2.0	9.8	11.0
North Central	57.9	12.1	1.2	.9	7.5	18.4
South Atlantic	49.3	4.9	.6	.9	18.0	26.3
South Central	44.8	5.2	.8	.6	17.3	31.3
Western	69.6	10.1	.6	3.1	7.7	8.9

This table shows that the percentage of tenancy is the highest in the Southern divisions and the lowest in the Western division. Farms operated by managers are relatively most abundant in the Western and in the North Atlantic divisions. In the West the farms operated by managers are largely cattle and sheep ranches, conducted for profit, while in the East these farms represent, in many cases, the country homes of wealthy families.

The negro seems to be an important factor in the problem of tenancy and landownership in the southern states. In the following table is given the percentage of all farms that are occupied by tenants; the percentage of all farms operated by white farmers, and occupied by tenants; and the percentage of all farms operated by negro farmers, who hold the land as tenants:

TENANCY IN THE SOUTHERN STATES.

Division and states	Percentage of all farms that are operated by tenants	Percentage of farms that are rented and operated by white farmers	Percentage of farms that are rented and operated by negro farmers
South Central	48.6	37.8	77.4
South Atlantic . . .	44.3	33.1	70.2
Georgia	59.9	44.8	86.0
Alabama	57.7	37.9	84.9
Mississippi	62.4	32.9	83.6
Louisiana	57.9	32.1	83.8

From the above table it will be seen that the situation in the South can be explained, in part at least, in terms of the negro population. It is relatively a short time since the freedmen started with nothing, and the fact that a small percentage of them, even, now own the land they cultivate is in itself an encouraging fact.

Tenant farmers.

There were few tenant farmers in this country in colonial days. In the South, the owner of a large estate operated his land by means of slave labor, and in the North farmers were usually landowners. Yet, in New England, to quote from "American

Husbandry," published in 1775, "the most ancient settled parts of the province, which are Rhode Island, Connecticut, and the southern part of New Hampshire, contain many considerable land estates upon which the owners live much in the style of country gentlemen in England. They all cultivate a part of their estates; and, if they are small, the whole; this they do by means of their stewards, who are generally called overseers; the rest is let to tenants, who occupy their farms by lease, and in the same manner as it is in the mother country; the rents paid for such farms being the principal part of the landlord's income." In New York, large feudal estates were common in the early history of the state, and only half a century ago were the occasion of much agitation and some legislation.

While it was the common thing in the early days of our national government for men of fortune to invest in the vast areas of western land, these lands were usually resold to settlers rather than developed into farms and let to tenants. Land was so cheap that, even before the days of the Homestead Act (1862), young men found themselves able to start at once upon their own land when they commenced farming for themselves. It was the common thing for the young men in the "free states" to work as hired hands until they had accumulated enough money to buy and equip farms.

With rising land values, thinking men of the older states began to doubt the desirability of having young men work for wages until they could buy a farm, and some advocated tenant farming as an intermediate stage between that of the hired man and the landowning farmer. In 1862, the relative merits of working for wages and of farming rented land as means of acquiring the money with which to buy a farm were discussed at great length.

While there were many objections to becoming a tenant farmer, there was this redeeming feature, that the young man who chose this method of earning the farm found marriage not only desirable but profitable, and as land values advanced, and the time required to save the money with which to buy a farm increased, this became a potent force, impelling the young man to become a tenant farmer. It gradually came to be true that the young man who had his farm to earn remained a hired man only until he was able to secure the necessary equipments for operating a farm. For such men, tenant farming became the next step, and, as a rule, these young men found themselves able in the course of time to buy farms. After the slaves were emancipated, tenant farmers became very common in the southern states.

The movement from tenancy to landownership.

There are no statistics available on the subject of landownership, in the United States, prior to 1880. The census of 1880 showed that 74.44 per cent of the farms were operated by owners, while 25.56 per cent were operated by tenants. This condition of affairs gave rise to much discussion concerning the probable future of the American farmer. Some writers considered tenancy a transitionary stage to landownership, while others contended that those who once had owned land finally lost it and became tenants, and that in time tenancy would become general.

Three sets of statistics on tenancy and landownership, those for 1880, 1890, and 1900, are now available, and a comparison of these figures shows that there has been a decline in the percentage of landowning farmers in the United States since 1880. The extent of this decline is shown in the following table:

TENURE OF FARMS IN THE UNITED STATES.

Date	Percentage of farms operated by		
	Owners	Cash tenants	Share tenants
1880	74.5	8.0	17.5
1890	71.6	10.0	18.4
1900	64.7	13.1	22.2

This table shows a decline of 9.8 in the percentage of landowning farmers during the last two decades of the nineteenth century; and the decline has been more rapid during the decade from 1890 to 1900 than during the preceding decade.

This decline in the percentage of landowning farmers does not necessarily imply, however, that farmers who once owned land lost it and became tenant farmers. The decline in the percentage of landowning farmers is due largely to the fact that a longer period is required to save the money with which to buy a farm. Hence, each succeeding generation of farmers must remain longer in the tenant class. This is shown in the following table:

PERCENTAGE OF PERSONS OWNING AND HIRING FARM HOMES.

	1890		1900	
	Owned	Hired	Owned	Hired
Under 25 years	32.6	67.4	27.7	72.2
25 to 34 years	49.8	50.2	45.3	54.7
35 to 44 years	64.0	36.0	64.4	35.6
45 to 54 years	72.3	27.7	70.7	29.3
55 years and over . . .	82.2	17.8	81.4	18.6

This table indicates that nearly three-fourths of the farmers in the United States under twenty-five years of age are tenants; that the percentage of tenant farmers declines, and the percentage of landowning farmers increases, as we pass from the younger to the older age periods, until less than a fifth of the farmers who are fifty-five years of age and over are tenants.

Statistics of this kind were first collected in 1890, and while they showed the status at that time and suggested a movement from tenancy to landownership, they did not prove the existence of such a movement. However, by comparing the figures for 1890 with those for 1900, this movement is clearly shown. The occupiers of farm homes who were from 25 to 34 years of age in 1890 were from 35 to 44 in 1900. By comparing these occupiers at the two dates, we find an increase in the percentage of home owners, from 49.8, in 1890, to 64.4, in 1900. Of the farm-home occupiers belonging to the age period from 35 to 44, in 1890, and to the age period 45 to 54, in 1900, 64 per cent were owners at the earlier date, and 70.7 per cent at the latter.

These figures indicate a constant movement from tenancy to landownership. This, however, is a commonplace fact recognized by all who actually observe agrarian movements. This movement is necessary. Young farmers start in with little capital, and through gifts, inheritances, or savings from their profits, they gradually acquire ownership. But, from generation to generation, a smaller percentage are able to make this transition. Of the occupiers of farm homes who were less than 25 years of age, a smaller percentage were owners in 1900 than in 1890 (table on page 175). This is true for every age period given in the table except one—the reverse being true for the period from 35 to 44. This suggests that the decline in landownership is due to the inability, or disinclination, of the succeeding generation to acquire landownership so generally as their predecessors.

If we wish to know why it is becoming more and more difficult for a farmer to acquire the ownership of land, we must study those forces and conditions that enable him to buy land, and also the conditions that retard his making investments in land. To improve the conditions with respect to the ownership of farms, some means of improving the farmer's facilities for making such acquisitions need to be devised.

Means of Acquiring Land

Hitherto the progress of agriculture in the United States has been powerfully influenced by the presence of vast areas of government lands which were easily secured, easily brought into cultivation, and which gave large returns on investments.

Government land. [Cf., page 50.]

The presence of these vast areas of cheap land of great fertility in a country where labor was scarce led to the invention of many labor-saving devices, until America became noted the world over for her agricultural machinery. Above all, the presence of free land has made the oppressions of landlords impossible, since the farmers have been able to take up valuable government lands.

This means of acquiring landownership has been very important from the time the first settlers landed in the New World until the present time. When, in the earlier days, land became scarce in Massachusetts, emigration to Connecticut set in, and, when the best lands in both of these colonies were occupied, there still remained unoccupied good land farther west. When the small farmers of Virginia were crowded out by the great planters, they found unoccupied lands in North Carolina, and later they followed Boone into the wilderness of Kentucky. In time the occupation of the Mississippi valley was completed, and in more recent years, since the great plains have been made easily accessible by railways, the settlement of new land has gone on at an exceedingly rapid rate.

That the acquisition of landownership was an easy task for the American farmer of the earlier days is indicated by the following quotation taken from a description of the settlements along the Monongahela in 1772 and 1773: "Land was the object which invited the greater number of these people to cross the mountains, for, as the saying then was, 'It was to be had here for taking up;' that is, building a cabin and raising a crop of grain, however small, of any kind, entitled the occupant to 400 acres of land, and a preëmption right to 1,000 acres more adjoining, to be secured by a land office warrant."

In 1790, Alexander Hamilton proposed a plan for the disposition of the public lands which reads as follows: "In the formation of a plan for the disposition of the vacant lands of the United States there appear to be two leading objects of consideration: One, the facility of advantageous sales, according to the probable course of purchase; the other, the accommodation of individuals now inhabiting the western country, or who may hereafter emigrate thither. The former, as an operation of finance, claims primary attention; the latter is important, as it relates to the satisfaction of the inhabitants of the western country. It is desirable, and does not appear impracticable, to conciliate both. Purchasers may be contemplated in three classes: Moneyed individuals and companies who will buy to sell again; associations of persons who intend to make settlements themselves; single persons or families now resident in the western country or who may emigrate thither hereafter. The two first will be frequently blended, and will always want considerable tracts. The last will generally purchase small quantities. Hence a plan for the sale of the western lands, while it may have due regard for the last, should be calculated to obtain all the advantages which may be derived from the two first classes."

The United States Government was slow in formulating the plan that finally became most significant in the conversion of the public domain into a nation of farms. The statesmen of the eighteenth century looked on the western lands "as an asset to be cashed at once for payment of current expenses of government and extinguishment of the national debt." This desire to convert the public domain into cash led to the sale of land in large tracts. Under the ordinance of May 20, 1785, surveyed lands were offered in lots as large as a whole township of thirty-two sections of 640 acres each, for not less than one dollar per acre. Under an act passed May 18, 1796, which provided for the survey of certain lands in the present state of Ohio, surveyed lands were to be offered at public sale in sections of 640 acres, and in lots of eight such sections each. The minimum price was then fixed at two dollars per acre. Prior to May 10, 1800, 1,484,047 acres of land had been sold from the public domain for the benefit of the United States. From these sales was realized $1,201,725.68.

Under an act of May 10, 1800, land offices were opened in the Northwest territory. The minimum price was kept at two dollars per acre. Lands were offered for three weeks at public sale in sections and half sections, and what remained at the end of this period was to be sold privately, as wanted, at the minimum price. During the next twenty years the net sales of government lands were 13,642,536 acres, from which the sum of $27,900,379.29 was realized. In 1820, the minimum price of land was reduced to one dollar and twenty-five cents per acre. The revenue idea was gradually abandoned and the settlement of the western country came to be looked upon as the principal end in view in the disposition of the public domain.

The preëmption system, which gave the preference to actual settlers in the sales of land at the minimum price, was embodied in sixteen special acts between 1801 and 1841. At the latter date a general act was passed which, with minor changes, remained in force until 1891. The actual settlers were permitted to enter upon tracts of land not larger than 160 acres nor less than forty acres before such lands had been offered at public sale. The requirements were that the person should reside in a dwelling upon the tract, improve and cultivate a part of the land, and after a limited period pay one dollar and twenty-five cents per acre.

"The preëmption system," says Donaldson, "arose from the necessities of settlers, and through a series of more than fifty-seven years of experience in attempts to sell or otherwise dispose of the public lands. The early idea of sales for revenue was abandoned and a plan of disposition for homes was substituted. The preëmption system was the result of law, experience, executive orders, departmental rulings, and judicial construction. It has been many phased, and was applied by special acts to special localities, with peculiar or additional features, but it has always and to this day (1880) contains the germ of actual settlement, under which thousands of homes have been made and lands made productive, yielding a profit in crops to the farmer and increasing the resources of the nation."

The Homestead Act of 1862 was the final step in the direction of free land for actual settlers. This law was the result, in part at least, of the agitations of the Free Soil Democrats. They claimed "that the public lands of the United States belong to the people, and should not be sold to individuals, nor granted to corporations, but should be held as a sacred trust for the benefit of the people, and should be granted in limited quantities, free of cost, to landless settlers."

The homestead law enables the landless farmers to secure a quarter section, (160 acres), of land and acquire a title to the same by maintaining residence thereupon and improving and cultivating the land for the continuous period of five years.

"The Homestead Act," says Donaldson, writing in 1880, "is now the approved and preferred method of acquiring title to the public lands. It has stood the test of eighteen years, and was the outgrowth of a system extending through nearly eighty years, and now, within the circle of a hundred years since the United States acquired the first of her public lands, the Homestead Act stands as the concentrated wisdom of legislation for settlement of the public lands. It protects the government, it builds up communities, and lessens the chances of social and civil disorder by giving ownership of the soil, in small tracts, to the occupants thereof. It was copied from no other nation's system. It was originally and distinctively American, and remains a monument to its originators."

From 1873 to 1891, a Timber Culture act was in force. This act, as first passed, enabled "any person" to obtain not more than 160 acres of land by planting forty acres of timber and properly caring for the same for ten years. The number of acres of timber required was finally reduced to ten, and the period of cultivation to eight years. The privilege came to be restricted, however, to persons twenty-one years of age, heads of families, citizens of the United States, or one who has filed his declaration of intention to become such. The law was a failure from the standpoint of timber culture, but in all 44,229,950 acres of land were entered by this method.

The total area included in farms was more than doubled between 1860 and 1900. The acreage in farms was 407,212,538 in 1860, and in 1900 it was 838,591,774. The importance of free land in this increase in the total area of land in farms is shown by the fact that between January 1, 1863, and June 30, 1900, 188,149,032 acres of land were entered under the homestead laws. It is estimated that public lands had been disposed of by the United States Government prior to June 30, 1860, to the extent of 417,587,322 acres; whereas 524,509,414 acres have been disposed of since that date.

During the decade from 1890 to 1900, the amount of land disposed of by the Government was much smaller than for the decade from 1880 to 1890. This falling off was looked upon at the time as suggesting that all the more desirable lands had been selected from the public domain. Since 1900, however, the number of acres disposed of each year has been much greater,—rising to almost 23,000,000 in the year ending June 30, 1903. In 1902, nearly 4,500,000 of acres were disposed of in Oklahoma, and slightly more than 2,500,000 in North Dakota. There were five states in which more than 1,000,000 acres of land were disposed of in 1902, namely, Wyoming, Montana, Oregon, Washington and Colorado. In 1903, nearly 3,000,000 of acres were disposed of in each of the two states, Florida and North Dakota, 2,000,000 in Wyoming, and between 1,000,000 and 2,000,000 in Colorado, Mississippi, Oklahoma, Oregon and Washington. During the past ten years, more land has been disposed of by the Government in Oklahoma than in any other state or territory. North Dakota ranks second in this respect. These facts suggest that the opening of Indian reservations to white settlers has been the most prominent factor in bringing about an increase during the last few years in the number of acres disposed of by the government.

That the free distribution of farms will soon reach its limit is shown by the fact that three-fourths of the total land area of the United States, exclusive of Alaska and the insular possessions, has been appropriated or reserved. Out of the total area of 1,900,947,200 acres, there yet remain about 473,836,000 acres unappropriated and unreserved. Of this, 270,267,760 acres have been surveyed. This land which is still open for appropriation is found principally in Arizona, California, Colorado, Idaho, Montana, Nevada, New Mexico, North Dakota, Oregon, Utah and Wyoming. Most all of the land that is desirable for agricultural purposes has been appropriated or reserved. When an Indian reservation is now thrown open to settlers, there are many applicants for every desirable piece of land. In the summer of 1904, there were in one case 106,308 persons registered with the hope of drawing farms where there were but 2,412 pieces of land of 160 acres each for distribution.

The presence of unoccupied lands of good quality, which has, hitherto, made the task of acquiring landownership an easy one in this country, will be of less and less significance as the years go by, and other considerations will become more and more important. This leads us to study the importance of gift and inheritance as means of acquiring landownership.

Gift and inheritance as aids in acquiring land.

A vast amount of wealth passes on from generation to generation by gift and inheritance. Hence, it is not necessary, in order to maintain the class of landowning farmers in a country where this class is already established, that the young generation of farmers save from the profits of their industry sufficient wealth to purchase their farms, and to hand this accumulated wealth over to the older generation of landowners. This would be necessary, however, in order to reëstablish a class of landowning farmers in one generation in a country where landlordism has become universal. In England, where most of the land is owned by a comparatively small number of landlords, the estates are handed down from generation to generation, and thus remain the property of the landlord class; and in that country it is unusual, indeed, for a tenant farmer to undertake to purchase a farm. In Germany, where peasant proprietorship is the rule, the farms are handed down from father to son by inheritance, and thus the property is kept in the hands of the tillers of the soil. The conditions with respect to inherited wealth are, therefore, of great importance in determining the status of farmers with respect to landownership.

In the United States, it is a matter of common observation that farmers who are able to do so, assist their sons in buying farms. This assistance may be relatively very great in the case of a wealthy farmer who has a small family; and again, it may be very small in the case of a farmer in moderate circumstances, who has a large number of children, among whom he wishes to distribute his assistance. Often the home farm is gradually enlarged by purchasing a "forty" here and an "eighty" there, while the boys are growing to manhood, and then parceled out as the young men wish to establish homes for themselves. Again, when the parents are gone, the remainder of their accumulated wealth passes by inheritance to their sons and daughters, and helps very greatly in the enlargement of their farms, as their growing families make larger farms desirable.

Movement of wealth away from agriculture.— The movement of population from country to city, which has been so great in recent years in this country, results in the movement of a vast amount of wealth away from the agricultural industry, which must be replaced from some source if the wealth of farmers is not to decline. The general principle may be thus stated: The greater the amount of land and other forms of wealth acquired by one generation and transmitted to the farmers of the next, and the more evenly this wealth is distributed, the greater the ease with which the ownership of land may be acquired by the succeeding generations of farmers; but the larger the farm families of a given community, and the larger the percentage of each succeeding generation who seek a livelihood in other industries, the greater the amount of wealth that will be drawn from agriculture into other industries by gift and inheritance, and the smaller the part that inherited wealth will play in the acquisition of landownership.

If only the poor moved from country to city, the total wealth of the rural district would be affected but little by this movement of population. But the rich farmers are quite as apt to move to the cities as are the poor ones; in fact, they are perhaps more likely to do so, for they are in a position to live from the rent of their farms, as many retired farmers are doing in nearly every town of the country. The sons of the well-to-do farmers are more likely to receive an education, and to be attracted to other pursuits, than are the sons of poor farmers; on the other hand, it may be true, in many cases, that the son of a poor farmer would be more likely to seek employment in the city, because his chances of getting a start in the country are not so good as those of the young man with a well-to-do father to aid him.

This stream of population is carrying a vast amount of wealth from country to city every year. This movement of wealth from country to city has rightly been given as one cause of an increase in the percentage of tenancy, for it transfers to the city the owners of many farms, and these farms are cultivated by tenants until the tenant farmers are able to acquire ownership by transferring to the city owner an equivalent amount of wealth.

Thus, while gift and inheritance are economic conditions of great importance in determining the status of farmers with respect to landownership, and make any rapid change in their status in this regard impossible, some other means of accumulating wealth must be available if the present percentage of landowning farmers is to be maintained. This leads to the investigation of savings in agriculture as a means of acquiring landownership.

Savings as a means of acquiring land.

The process of saving from the earnings of many years and making a purchase is a means of acquiring landownership that is of especial significance in the consideration of the conditions that make it possible for tenant farmers to become landowners. The majority of the tenants are able to save from their earnings, because their net returns are more than enough to cover the expenses of living. When long periods of time are taken into consideration, the prices of agricultural products tend to be such that the total product of the least capable farmer who can remain permanently in the business will equal his cost of living and all other annual expenditures, including rent and normal returns on permanent investments. This is true, partly because long-time-average prices are a most important factor in determining the degree of efficiency that is necessary for making a living by farming, and all who do not prove themselves efficient to that degree, must leave agriculture to those who are more capable; again, it is true, partly because the long-time-average price must be such as will encourage the production of sufficient produce to supply the effective demands of the people, and the least capable farmer who is required to produce this supply must receive prices that will enable him to live in accordance with his idea of a living, to pay rent, wages (unless he and his family do all the work, in which case this item is included in a living), wear and tear on machinery, and normal returns on permanent investments.

It is true, certainly, that, at any given time, there are those who are producing at a loss, others who are just able to make both ends meet, and still others—and ordinarily this class includes the vast majority—who are able to make an extra profit because of their superior ability.

This differential gain, or profit, due to superior ability, is the condition that, even when gifts and inherited wealth are insignificant, makes it possible for farmers to accumulate wealth and to become the owners of farms. It is true, certainly, that the more efficient may live much better than the least capable, or marginal farmers, and thus the habits of life may reduce the power of the more efficient farmers to save from their profits. But the condition that gives rise to this differential gain certainly makes it possible for the more efficient tenant farmers to buy land.

The greater the number of those who have gained a degree of efficiency above that of the marginal farmers, and the greater the difference between the degree of efficiency of the majority of farmers and that of the marginal farmers, the greater is the differential gain that will go to farmers as personal profits, and the better able they will be to become landowners. On the other hand, the more homogeneous the farmers who supply the market, that is, the smaller the number who have gained a degree of efficiency above that of the marginal farmer, and the less this degree of difference, the smaller is the total differential profit, and the less able are tenant farmers to accumulate sufficient wealth to buy farms. [See Rents and Profits, page 185.]

Credit as a means of acquiring land.

It is a common practice in the United States for farmers to borrow money to invest in land. When a young man has saved enough money to pay some share, say half or two-thirds, of the price of the farm, he borrows the remainder and makes an investment, a mortgage being given to secure the loan. This enables the farmer to buy land much sooner than he could if he were required to save the entire amount before making the purchase. When the rate of interest is not too high, it is often more desirable to pay interest than to pay rent; for the difficulty of adjusting the relations between landlord and tenant is in this way removed, and the farmer is free to improve the land as he chooses, knowing that the benefits will be his own.

A study of the mortgage indebtedness of farmers in the United States, in 1890, showed that 18.6 per cent of all the farm families occupied encumbered farms. The total encumbrance of farm homes amounted to $1,085,995,960, which was 35 per cent of the total value of the encumbered farms, and 8.2 per cent of the total value of all farms. An investigation of the distribution of farm mortgages showed that, throughout the southern states where the percentage of tenancy was very high, the percentage of encumbered farms was very low; that the six states having the highest encumbrance on farms were New York, Pennsylvania, Ohio, Illinois, Iowa and Kansas; the total encumbrance of these states being $553,964,594, or 51 per cent of the total for the United States; yet with this high total encumbrance, the mortgages represented only 37.25 per cent of the value of the encumbered farms and 9.86 per cent of the total value of all farms in these six states. Thus while a large percentage (51) of the farm-mortgage indebtedness of the United States is concentrated on a small area, there is also a large percentage (42.3) of the farm values concentrated on the same area.

Significance of the mortgage.—Mortgages on farms are in the vast majority of cases used as a means of making the transition from tenancy to landownership. The evidence presented in the Eleventh Census seems to show that the farmers are usually successful in their use of the mortgage as a means of acquiring the ownership of land. In Illinois, Michigan, Minnesota and New Jersey, from ⅓ to ½ per cent, only, of the farm mortgages are foreclosed each year; the average duration of farm mortgages in the United states is about five years. From this we may conclude that in the above-named states not much more than from 1⅔ to 2½ per cent of the farm mortgages are foreclosed. But we cannot argue from this that from 97½ to 98⅓ per cent of the mortgages are duly paid out of the profits of agriculture. Many cases will come to the mind of the reader, where the unsuccessful aspirants to landownership have sold their mortgaged farms in order to pay off the mortgage and save a part of their original investment. However, it is fair to say that the vast majority of such adventures prove successful.

When we consider the mortgage in all of its relations it is apparent that this is one of the important means of acquiring landownership; and while it sometimes proves disastrous, it is practically indispensable in our rural organization, and on the whole it may be looked upon as an institution friendly to the interests of the farmers.

Credit institutions.—The thing most to be desired is not less borrowing of money on the part of farmers, but better opportunities for securing funds to invest in their business. Credit institutions of Germany (Landschaften) are much needed in the United States. At the present time the farmer who borrows money to invest in land must pay more for its use than he would have to pay as rent for the use of the same land. This is due not only to the poor credit system, but also in part to the system of taxation practiced in most of our states.

Double taxation.—This difference between net rent and interest is due to many causes, including the security of the investment, the prospect of a rise in the rental value of land, social standing based upon the ownership of land and similar considerations, but we wish to emphasize especially the influence of double taxation in this connection. Double taxation, the taxing of both the farm and the mortgage upon the farm, tends to increase the difference between the rate which must be paid upon the loan and the returns received upon investments in land. The man who lends money upon a mortgage wants at least as large a return as if he had purchased the land himself. Had the man who lent the money purchased the land and rented it, he would have paid the land tax out of the net rent. If he lends the money and has to pay tax at the same rate on the mortgage, he will demand interest equal, at least to the net rent of that proportion of the farm represented by the face of the mortgage. This means that the farmer will have to pay interest equal to the net rent and then pay the land tax besides; thus paying more in interest and in the tax, by the amount of the tax, than he would have paid as a tenant. To tax a farm mortgage is, therefore, to tax a farmer for using the mortgage as a means of acquiring landownership.

THE RELATIONS BETWEEN LANDLORDS AND TENANTS

Thirty-five and three-tenths per cent of all the farms in the United States, exclusive of Alaska and the insular possessions, were occupied by tenant farmers in 1900. In all, 2,024,964 farms were operated by this class of farmers. Of these, 1,273,299 or 62.8 per cent were operated by share tenants and 751,665 or 37.2 per cent by cash tenants. A farm was said to be operated by a cash tenant if cultivated by a tenant who paid "a fixed rental in money, or a stated amount of labor or farm commodities," and by a share tenant if operated by a tenant who paid "for its use a share (as one-third, or one-half or other proportion) of crops raised."

The ownership of these rented farms is not concentrated in the hands of a few wealthy persons as is the case in England, but is widely distributed. Of the 1,934,346 rented farms in the United States for which the names and post-office addresses of the owners were reported, the owners of 1,523,863, or 78.8 per cent resided in the same county in which their farms were located; 307,656, or 15.9 per cent, in the same state but not in the same county; 102,827, or 5.3 per cent, outside of the state, 1,097 of whom resided in foreign countries.

The Western division had the smallest proportion of rented farms whose owners resided in the county where their farms were located. The South Central and South Atlantic divisions had the largest proportion of owners residing in the county where their rented farms were located. The North Central division had the largest, and the Western the next largest, proportion of rented farms with owners residing outside of the state. Eighty per cent of the owners of rented farms in the United States owned but one rented farm each, and 52 per cent of the rented farms were owned by persons who owned but one rented farm. The ownership of rented farms is more concentrated in the southern states than in other parts of the United States. This is explained in the census report as follows: Originally, great areas of land in the South were held in large plantations and operated by slave labor. After emancipation that form of labor was superseded by some form of contract leasehold, by which the former slaves or wage laborers were given charge of small tracts of land upon which they were to raise crops.

Thus we find that, while more than a third of the farmers of the United States hire the land which they cultivate, these hired farms are so generally held by men who live near by, that the relation of landlord and tenant is generally a personal one, and the problems of absenteeism and of concentration of ownership which have been so perplexing in certain other countries have as yet been of little significance in the United States. Nevertheless, the statistics for the last twenty years show a significant increase in tenancy, and it is to be expected that the men who have made fortunes in the great industries of the cities will eventually invest some of their savings in landed estates, and in this way bring forward problems from which we have hitherto been comparatively free.

Share tenancy.

Share tenancy is preferred by many tenant farmers because the risk is less than in cash tenancy. The thought of paying a fixed rent whether the crop is large or small and whether the prices are high or low is not attractive to the majority. And again, many of the tenants do not possess sufficient wealth to enable them to own all of the stock necessary to operate a farm on a cash basis.

The landlords who live in close proximity to the land which they let, and who have time to devote to its supervision, usually prefer a share of the crop because they find it more profitable to them. The share system is more profitable to the landlords largely because of the close supervision they give to the farms let on shares. Many of the tenants are young and inexperienced, and are willing to leave the general management of the farm to the landlord, who is very likely to be an elderly farmer, and the fact that he has a farm to let suggests that he has been a successful farmer.

All tenants are not so willing to be directed by their landlords, but if they pay a share of the products as rent, the landlord's right to give advice is apparent, whereas, if cash is paid there seems to be no good reason why the tenant should not do as he likes. The principle being established that the landlord has a right to direct more or less definitely the operations of the farm, as in the case of share tenancy, the landlord has little difficulty in so directing the management of the farm as to preserve the fertility of the land. The choice of crops, and the organization of the field-system are subjects which the share tenant is usually willing to leave to the landlord, and in many cases the landlord controls the field operations in the minutest detail. For example, the depth to which land is to be plowed, the time of sowing, planting and harvesting, the number of times a field of Indian corn should be cultivated, etc., are details to which the landlord often gives his attention under this system of letting land. The landlord is willing to exert himself for these purposes because his profits are increased by such activity.

Another reason often given by landlords for preferring a share of the crop to a cash rent, is that, in a country where most of the tenants have little wealth, a share of the product proves more profitable to the landlord, in the long run. He shares the benefit of an extra large crop and gets something out of the smallest one. In case he is receiving a fixed rent, however, the tenant gets all the advantage of an extra large crop, and in case of a crop failure the tenant is often unable to pay the fixed rent. The landlord has to bear the losses when the crops are short without getting the advantage of the extra large crops. When the tenants are men of considerable wealth, this is a matter of less importance.

Again, it is said that the collection of the rent is an easier matter when a share of the crop is given. "Farmers will give a fifty-cent chicken for a church dinner when they would not think of giving as much as twenty-five cents in cash," says an Iowa farmer who has tried both systems, and he continues, "They will give the landlord his share of the farm products much more cheerfully than pay him cash."

The share rent adjusts itself to changes in the value of the products without any change in the contract. This is looked upon by some farmers and landlords as a reason of first importance for adhering to the share system.

Reasons for success of share tenancy.—Participation of the landlord in the management of the farm, is the chief reason for the success of share tenancy in this country. This point has been emphasized over and over again in the communications received from men who are in a position to know. Share tenancy is, as a rule, more profitable to the landlord only when the farm is under his immediate supervision. If the management must be left entirely to the tenant farmer the cash system is usually preferable to the landlord. If the tenant is a capable manager, so that the supervision of the landlord adds nothing to the product, then it is better for the tenant to pay a fixed rent and secure the extra profits due to his superior ability.

Forms of share tenancy.

The methods of letting land for a share of the products are so very numerous that to describe all the forms of share tenancy is practically impossible. Perhaps the simplest form of share tenancy arises when one farmer has more land than he cares to cultivate while some of his neighbors have less than they wish to cultivate. This leads to a form of share tenancy in which persons living on their own farms and in their own houses simply enter the fields of the landlord to grow a crop of grain or to make hay on shares. The usual method is for the tenants to furnish seed, teams, tools and machinery. In some cases, the bill for binding twine and the threshing bill are paid entirely by the tenant, and sometimes these bills are divided between landlord and tenant in the same proportion in which the grain is shared.

The landlord's share of the crop varies in different parts of the country from one-third to one-half of the grain, to be put into the landlord's bin or delivered at the market. When meadows are let in this way, one-half or more of the hay is delivered to the landlord in the mow or in the stack. Under this system, the landlord has absolute control of the kinds of crops to be grown and of the system of crop-rotation. The land is usually let for but one year. A serious objection to this system is that a large share of the product is taken from the land and sold or fed out on another man's land.

The share system becomes somewhat more complex when the landlord furnishes a house and barn and garden-patch for the tenant. If the tenant desires to keep but little live-stock, let us say a team, a cow, a few hogs, and some poultry, his living upon the place will not make a great difference in the system; but if he desires to keep sufficient live-stock to consume his share of the crop, and especially if he wishes to keep cattle, the system becomes more complicated. The tenant's demand for pasture land is often met by leasing to him, for a cash rent, a certain amount of land to be used for grazing purposes. The feeding of the crop on the farm is an important advantage of this method of letting land. In tenancies of this description, the contracts are most commonly drawn for but one year, with the understanding that a satisfactory tenant may renew his contract from year to year.

The share system of the negroes (p. 106).—Among negro farmers there are two classes who work for a share of the crop. The cropper is entirely without capital, even in the limited sense of food or money to keep him from seed time to harvest; all he furnishes is labor, while the landowner furnishes house, land, stock, tools and seed. At the end of the year the cropper gets a stipulated portion of the crop; out of his share, however, comes payment, with interest, for food and clothing advanced him during the year. Thus we have a laborer without capital and without wages, and an employer whose capital consists largely of food and other supplies advanced to these "share hands." Above the cropper comes the share tenant who works the land on his own responsibility, paying rent in cotton, and supported by the crop-lien system. The great mass of the negro population is found in this class. After the war, this plan attracted the freemen on account of its larger freedom and its possibility for making a surplus.

Share tenancy and live-stock partnerships.

It is quite generally true in the United States, that tenant farmers are young men who do not as a class possess a great amount of wealth which can be invested in live-stock. In the dairy district, it is common for the landlord to furnish a part of the live-stock. In some instances, the landlord furnishes a given number of cows, and other kinds of live-stock, while the tenant furnishes the horses (the number to be kept being limited by the contract), the tools, machinery, and the like, necessary to operate the farm. In other instances, the "stock and land" lease is so arranged that the landlord and the tenant each owns a half interest in all of the live-stock, tools, machinery, and the like, necessary to operate the farm. The tools and machinery are sometimes furnished by the tenant, and in other cases each party owns a half interest in them; in fact there exists the greatest variety of arrangements between landlords and tenants. The management of the farming operations is usually under the close supervision of the landlord. The product is usually shared equally by landlord and tenant. This form of tenancy is essentially a partnership in which the labor is balanced against the land.

The landlords are usually unwilling to enter into an agreement to let land on this plan for more than one year, unless they know the tenant. On the other hand, it is well understood by both parties that it would be unprofitable to enter into a partnership of this kind for but one year. It is common, therefore, when the landlord and the tenant are acquainted with each other, for tenancies of this kind to be entered upon for three- or five-year periods, with the understanding that the tenant is to remain for a much longer period if satisfactory to both parties.

Elements of success of the share system.

Where land is let for a share of the crop, there are so many details that must be agreed upon by both parties that troublesome differences of opinion are likely to arise. It is the general opinion among those concerned, however, that, when difficulties arise between landlords and tenants, it is usually due to the fact that one or both of the parties is too grasping. A grasping landlord drives the tenant to use dishonest means in order to make both ends meet. The landlord who is willing to give his tenants a fair chance, and then insists on good farming and honest business, and who discharges at once every tenant who is very inefficient and not strictly honest, will have little trouble with his tenants.

Time and again, landlords have said to the writer that if both parties would observe the golden rule there would be no occasion for trouble between landlords and tenants. There is occasion, very often, for the use of the golden rule in the relations between the share tenant and his landlord. This is true because of the close relations into which they are thrown in the management of the farm. The landlord may think that a certain field of Indian corn should be cultivated one time more than the tenant cares to cultivate it. The tenant may figure that his share of the additions to the crop due to the extra cultivation will not remunerate him for the extra effort. In a case of this kind, however, the fair-minded tenant should be willing to give as many cultivations to the crop as he would if he owned the land, and this is all a fair-minded landlord should ask.

And yet fair-mindedness is not all that is necessary to the proper adjustment of the relations between landlord and tenant. On most farms, no records are kept that give the parties concerned a basis for passing judgment upon what may be a fair rent, which system of cropping, and which disposition of the produce will pay best. Ignorance is often the basis of suspicion that the other fellow is getting the best of the bargain. Before the landlord and the share tenant can hope to agree perfectly, a system of cost accounting will need be introduced upon the farm. The golden rule is the proper principle, but it is abstract. Concrete facts are required as a basis if one is to live up to this rule.

Cash tenancy.

Cash tenancy is usually considered by economists as a step in advance of share tenancy. "This method of putting out lands to farm," says Turgot, a French writer, whose work was published in 1770, "is the most advantageous of all, both to the proprietors and to the cultivators; it establishes itself everywhere where there are rich cultivators in a position to make the advances of the cultivation; and as rich cultivators can provide the land with much more labor and manure there results from it a prodigious increase in the produce and revenue of estates. In Picardy, Normandy, the neighborhood of Paris, and in most of the provinces of the north of France, the lands are cultivated by cash tenants. In the provinces of the South they are cultivated by share tenants; the provinces of the north of France are likewise incomparably richer and better cultivated than those of the south."

While only a little more than a third of the tenant farmers of the United States pay cash rent, this form of tenancy has been increasing more rapidly in recent years than has share tenancy. In 1880, 31.1 per cent of farms operated by tenants were operated by cash tenants; in 1890, 35.1 per cent; and in 1900, 37.2 of all such farms were let for a cash rent.

Landlords who live too far from their land, or are too busy, to give it the needed supervision for making share tenancy a success, usually prefer to let their farms for a cash rent. It is claimed by many landlords that the tenants devote much greater care to their farming under the cash system of letting land. The feeling that every extra bushel of grain and every extra fork of hay is all his own will naturally make the tenant more painstaking than he will be if only a part of these products are to be added to his own profits.

Problems of cash tenancy.

This desire to obtain as large a return as possible is, at the same time, the greatest source of trouble in adjusting the relations between landlords and tenants. The tenant who has a contract for but one year is inclined to look too strictly to securing as large a profit as possible for that one year without any regard to the future. As a result of this short-sighted economy, too large a proportion of the land is often devoted to exhausting crops and the larger profit of the one year is obtained at the expense of the profits of future years. By proper regulations with respect to the proportion of the land that shall be devoted to certain crops, this difficulty can be more or less successfully overcome, but such regulations are always annoying to the tenants.

To induce tenants to follow a system of cropping that will best conserve the soil, landlords have sometimes practiced charging a lower rent on that part of the land which is in clover or pasture than for the fields that are devoted to the more profitable and more exhausting crops. The granting of a lease for several years is thought by many to be all that is necessary to meet the difficulties arising from the short-sightedness of the tenants, but many landlords object to making a contract for a period of any great length. With all the difficulties that may beset this system, cash tenancy is preferable to share tenancy whenever the management of the farm is to be left almost entirely to the tenant. When agriculture is extensive and when the use of commercial fertilizers is unknown, the letting of land for cash usually causes little trouble, but results in soil exhaustion.

When intensive culture and the use of commercial fertilizers have become necessary, the tenant problem takes on a more acute form. If we would study to advantage the problems that arise under these conditions, we must turn our attention to an older country than our own, where the tenant problem has been a more serious one, and where we may learn from the experience of others the remedies that are fast becoming necessary to good relations between landlords and tenants in this country.

The tenant problem in England.

More than one hundred years ago the tenant problem became a serious question in England. The English rural economists of that time were of the opinion that fair rent and fixity of tenure were the two essentials of good agriculture when land is cultivated by tenant farmers. Long leases were advocated because they were thought to be the only means of inducing farmers to farm intensively. When commercial fertilizers were to be used, and various other investments made in the soil on which the tenant could not be expected to realize the full return for a number of years, that fixity of tenure secured by a fourteen- or a twenty-one-year lease was believed to be necessary to good agriculture.

Security of investments was the fundamental reason for desiring fixity of tenure, and this came in the course of time to be attained by other means than the long lease. Long leases were objectionable on many grounds, and the custom of compensating the outgoing tenant for the unexhausted improvements he had made in and upon the land, at the value they were worth to the incoming tenant, gave security to the tenant who held from year to year. After about thirty years of agitation, this custom was formulated and enacted by Parliament as a law to which every landlord of the country was required to conform. The Agricultural Holdings Act as now in force enables the tenant farmers to obtain from the landlords as compensation for improvements, at the termination of their tenancies, "such sum as fairly represents the value of the improvement to an incoming tenant."

The improvements for which compensation can be claimed under this law are divided into three classes. The first class includes all those improvements to which the consent of the landlord is required if the payment of compensation is to be enforced by law. This class includes the following list of improvements:

(1) Erection or enlargement of buildings.
(2) Formation of silos.
(3) Laying down of permanent pasture.
(4) Making and planting of osier beds.
(5) Making of water meadows or works of irrigation.
(6) Making of gardens.
(7) Making or improving of roads or bridges.
(8) Making or improving of water-courses, ponds, wells or reservoirs, or of works for the application of water-power or for supply of water for agricultural or domestic purposes.
(9) Making or removal of permanent fences.
(10) Planting of hops.
(11) Planting of orchards, or fruit bushes.
(12) Protecting young fruit trees.
(13) Reclaiming of waste land.
(14) Warping or weiring of land.
(15) Embankments and sluices against floods.
(16) The erection of wirework in hop gardens.

The above are subject to the provisions given under the third class of improvements with respect to market gardens.

The drainage of land is put into a class by itself.

It is required that the tenant shall give notice to the landlord of his intention to construct a drainage system if he is to expect compensation under the law for his improvement. This notice must be given not more than three months nor less than two months before the beginning of the execution of the work, and during this time the landlord may, if the tenant has not in the meantime withdrawn the notice, "undertake to execute the improvement himself, and may execute the same in any reasonable and proper manner which he thinks fit, and charge the tenant with a sum not exceeding five pounds per centum per annum on the outlay incurred in executing the improvement, or not exceeding such annual sum payable for a period of twenty-five years as will repay such outlay in the said period, with interest at the rate of 3 per centum per annum, such annual sum to be recoverable as rent. In default of any such undertaking, and also in the event of the landlord failing to comply with his undertaking within a reasonable time, the tenant may execute the improvement himself, and shall, in respect thereof, be entitled to compensation" under the Agricultural Holding Act.

The third class includes a large number of improvements for which compensation can be claimed under the law, without having gained the consent of the landlord or having given notice to him previous to the execution of such improvements. The list of improvements put into this class is as follows:

(18) Chalking land.

(19) Clay burning.

(20) Claying of land, or spreading blaes upon land.

(21) Liming of land.

(22) Marling of land.

(23) Application to land of purchased artificial or other purchased manure.

(24) Consumption on the holding by cattle, sheep, or pigs, or by horses other than those regularly employed on the holding, of corn, cake, or other feeding-stuffs not produced upon the holding.

(25) Consumption on the holding by cattle, sheep, or pigs, or by horses other than those regularly employed on the holding, of corn, proved by satisfactory evidence to have been produced and consumed on the holding.

(26) Laying down temporary pasture with clover, grass, lucerne, sainfoin, or other seeds sown more than two years prior to the determination of the tenancy.

(27) In the case of market-gardens: (*a*) Planting of standard or other fruit trees permanently set out; (*b*) planting of fruit bushes permanently set out; (*c*) planting of strawberry plants; (*d*) planting of asparagus, rhubarb, and other vegetable crops which continue productive for two or more years; (*e*) erection or enlargement of buildings for the purpose of the trade or business of a market-gardener.

In ascertaining the amount of compensation payable to a tenant, account is taken of any benefit that the landlord has given or allowed to the tenant for making the improvement. Also, in case the tenant is under contract to return a certain amount of manure to the soil every year, and in case such amount shall not exceed the amount that is derived from the feeds that are produced upon the holding, this amount is excluded from the amount for which compensation can be claimed.

In case the landlord and tenant fail to agree as to the amount of compensation the tenant should receive for the various improvements that have been named above, the difference is settled by means of arbitration.

In case of any breach of contract on the part of either landlord or tenant, damages may be claimed by the party injured. Also, in case the tenant causes or allows any waste, injures the soil, or destroys the improvements, the landlord may make a claim for payment for such injuries. These claims are arbitrated the same as those for improvements.

In case of permanent improvements, such as are not mentioned in either of the above classes, the tenant may remove the improvement unless the landlord may choose to buy the same, with the proviso that he repair any damages that may have been incurred by the removal of the building, that is, he must leave the premises in as good condition as if the improvement had not been made.

It is the usual thing for the incoming tenant to pay the sum which is due the outgoing tenant as remuneration for improvements; and, in case the new tenant remains but a short time on the farm, so that at the expiration of his tenancy he has not had time to realize in full upon such investments, he receives remuneration for such improvements just the same as if he had executed them himself.

These are the essential points of the Agricultural Holdings Act of 1883 as modified by the amending Act of 1900. The changes made by the amending Act were matters of detail, meant to meet certain objections to the practical workings of the original act. This law, as it now stands, seems to supply the regulations necessary to an amicable adjustment of the relations between landlord and tenant in England.

Tenancy from year to year is the rule in England today, and no question is raised as to the security of the landlord or of the tenant. Either party may bring the tenancy to a close at the expiration of any year, by giving proper notice. Under the act, twelve months' notice is required, but by special agreement between landlord and tenant the time may be changed to six months.

Written contracts are generally used, but the leading agriculturists of the country agree that such contracts should contain few restrictions upon the methods of farming, except that the farm shall be operated in accordance with the rules of good husbandry. The farmers and the landlords of England have quite generally come to recognize that liberty and honesty are essential to success in agriculture.

Conclusion.

No set of laws will make a good tenant system. At least two things else are necessary. The landlords and the tenants must have a high sense of justice which will lead to a mutual recognition of each other's rights; and the science of agriculture must have arrived at that stage of development in which it is possible to ascertain what is right and fair. For example, both landlord and tenant may be fair-minded, and yet without a knowledge of the rapidity with which a given fertilizer is made use of by a given system of cropping on the various kinds of soils, it is impossible to come to an accurate conclusion as to the proper compensation to be paid to the retiring tenant for unexhausted fertilizers. The British system is the result of a century and more of progress in agriculture, during which time "science with practice" has gradually wrought out a plan for adjusting the relations between landlords and tenants more complete than that found in any other country. Other countries should follow this excellent example by grasping the spirit of the British system and by developing the details to suit their own conditions rather than by attempting to transplant the system in detail.

LAND-TENURE SYSTEMS IN CANADA

By *Walter S. MacBrayne*

Land-tenure systems in Canada, owing to the influence of England, bear, to a greater or less extent, the characteristics of those in the mother country. It is possible in this article only to mention briefly what the systems are, and not trace their history and evolution.

Titles to land.

Crown patents.—The title to land in Canada is based on the tenure of lands in England, in consequence of the application of English laws to an English colony. Under this tenure, the sovereign is regarded as the lord paramount, as he was under the feudal system, and all tenures in England and in Canada have their foundations in this system. According to this system, the sovereign makes all grants of land, whether in large or small tracts, and this primary conveyance is known as a "Crown patent." These patents are made by the several provinces through a department having control of the Crown lands in each province, and are under the great seal of the respective provinces.

Fee-simple estates.—On such a grant being made, the grantee acquires an estate in the lands which may be assigned by deed or transmitted by will. This estate in the lands is known as the fee-simple, and is the right of property in land in the fullest degree and held by the grantee and his heirs forever, generally, absolutely and simply. Notwithstanding the terms of the grant, the principles of the feudal system still apply to the extent that, technically, the holder of such a title has only the usufruct or use of the land and not the absolute property therein, the sovereign remaining still the absolute owner of the soil. This feature is not of practical importance, however, as there is no intervention on the part of the sovereign, and the feudal service originally incident thereto, such as the payment of rent, the rendering of feudal service, and the like, is never demanded or its rendition ever required from the holder of the fee. In the original surveys of lands into lots, that part of the land comprising the highways is reserved from all grants of land and remains vested in the sovereign, and is, in reality, "the King's highway."

The estate of fee-simple is the greatest estate in land which may be held, and this estate has been defined as being transmissible with the greatest freedom as to the heirs of the holder of the fee.

Estate in tail.—Other estates may be held as, for example, an estate in tail, which limits the descent of the estate to certain defined heirs of the body of the owner of the fee, thereby destroying that absolute right of choosing the persons in whom the estate shall be vested, and defining, by the conveyance, the line of heirs who shall succeed the grantee after his death. Thus, a conveyance to a man and the heirs male of his body will prevent him from making a disposition of the property which would exclude the persons coming within that description of acquiring the estate on his death. Such conveyances are comparatively rare. In order to facilitate, as much as possible, the untrammeled transfer of estates, the different provincial legislatures have followed the precedent established in England, and these estates may now be barred by a suitable conveyance. The practical effect of this legislation is that this form of tenure, which was and still is in such vogue in England, may be completely nullified and converted into a fee-simple, if the holder of such an estate makes use of the statutory powers conferred on him.

Estates may also be limited for the life of the grantee, with a grant after such life-estate to another person, or an estate may be granted limited for the life of another. It will be at once apparent how much less these estates are than the estate in fee-simple, which has been described.

Dower estate.—Other estates arise by operation of law. One of these is that of dower, which a widow has in one-third of all her husband's lands of which he was the owner in fee-simple during the marriage. This estate ceases on the death of the widow, and, if the wife should predecease the husband, her inchoate right of dower dies with her. In the provinces of Manitoba, Alberta and Saskatchewan this estate does not exist, and a married man may convey his property quite independently of the concurrence of his wife. In the other provinces, where this right exists, the wife is a necessary party to every conveyance for the purpose of barring her possible claim to dower in the lands conveyed.

Tenancy by the curtesy.—Another of such estates arising by operation of law is known as tenancy by the curtesy. This is the right which a married man has in his wife's lands after her death to hold for his life. Since "The Married Woman's Property Act" has been passed, married women are enabled to hold and convey lands entirely free from any claims of their husbands, and this estate has consequently almost ceased to exist.

Transmitting title to land.

The method of transmitting title to lands is by deed duly signed and sealed by the grantor and delivered to the grantee. Particular forms are not imperative, but it is essential that the parties to the deed, the description of the lands to be conveyed and the estate to be held by the grantee should be particularly set forth. In many of the provinces, the legislatures have passed acts permitting specified forms of deeds to be used, wherein certain symbolical short forms are given the meaning ascribed to them in the long form contained in the different statutes, and when a deed is described as having been prepared in accordance with such act the interpretation given in the act is read into the deed. It is needless to point out that such a method of conveyance tends to uniformity and to great simplicity in the transfer of property. The tendency of all legislation relating to transfers of land has been to simplify as much as possible all the different deeds required for such purpose. The voluminous conveyance with its lengthy recitals and covenants extending over many pages has been thus displaced by the statutory form of deed, and the language used in such deed carries with it a legislative interpretation which renders applications to the Courts for interpretation an infrequent occurrence.

Registration of titles.

A general registration act in each province provides registration offices in each county, where all documents relating to lands may be registered. Such documents are executed in at least duplicate parts and it is essential for registration that the document should bear the signature of a witness who has seen the different parties sign the document, and that an affidavit of execution in a prescribed form duly sworn to by the witness should appear on one of the copies presented for registration. The copy with the affidavit annexed is retained in the registry office, and the other copies of such deed with a certificate of registration endorsed is returned. The registered instrument is copied in full in a book provided for that purpose, and an abstract of the document entered in another book. This last-named book contains in chronological order a synopsis of all transactions relating to the land in question, and its history may be seen at a glance on reference to this book. If fuller information is sought respecting any deed appearing in this abstract, a perusal of the original document may be obtained. Every purchaser of land is entitled to have delivered to him with the other muniments of title a certified copy of this abstract, and as this is brought up to date from time to time as conveyances affecting the property are registered, the condition of the title is at once shown. No abstracts are furnished by any person except the registrar and he is responsible for any loss that may be sustained by the delivery of a copy that is not a complete and accurate copy of the entries in his books.

Apart from the complete preservation of the records of any transaction, the registration of a document is notice to the world of the transaction so recorded, and all persons dealing with the property subsequently are treated as having had actual notice of the contents of such document. The registration referred to is not limited to deeds, but agreements, liens, wills, mortgages, leases, in short, all documents affecting the lands may be registered.

Each successive purchaser is entitled to have all questions relating to the title explained and verified to his satisfaction, and the acceptance of the title by one purchaser is not conclusive in any way on a subsequent purchaser. To obviate this difficulty, two systems have been adopted. The first is known as "The Quieting Titles Act," under the provisions of which an owner may have his title investigated, and if shown to be free from defect he is given a certificate by the Court to that effect. This effectually shuts out any further inquiry for the period prior to the certificate, but all matters subsequent to the date of the certificate are open to investigation and inquiry. The other is what is known as the "Torrens system." Under this system, the title may be investigated and a certificate given showing the owner, etc., and each subsequent transfer is verified by the production of a new certificate issued by the registrar. Under this system, there is no examination of title at all; the vendor produces his certificate, and if no adverse claims appear thereon a purchaser may rest assured that no such claims exist and that he is running no risk in accepting the title submitted to him.

The tenure of lands above described prevails throughout the various provinces of the Dominion of Canada. Each province has complete control of the registration of titles and the conveyance of lands within the respective territorial jurisdiction of each, but these are practically the same throughout the different provinces. In the western provinces, the Torrens system of registration prevails, while in the eastern provinces the old system is still in vogue, although in the province of Ontario land may be brought under the Torrens system and the simplified method of transfer will subsequently apply to such lands. The Torrens system of registration has been applied with the greatest facility and success in the provinces of Manitoba, Alberta and Saskatchewan, owing to the fact that it was introduced on the opening of these provinces for settlement, while in the older provinces of Ontario and Quebec and the Maritime provinces the large expense necessarily entailed by the investigation by the court of all prior transactions relating to the property has had a deterrent effect in its introduction, although the merits of the system are generally admitted.

Seignorial tenure.

In making surveys of lands in the eastern provinces of Canada, the rectangular farm of 100 acres was adopted as the unit, while in the prairie sections the block of one mile square has been adopted, and this again subdivided into four parts of 160 acres each, and of equal width and length. An exception to each of these methods of laying out the land is observable in Quebec, particularly in the farms lying along the rivers Richelieu and St. Lawrence. There the farms are extremely narrow and extend back from the river a distance of ten or twelve times their width. This peculiarity dates from the early days of the French settlement of Quebec, when the lands were all held under seignorial tenure,—a system involving all the characteristics of the feudal system. These pioneer settlers desired not only easy access to the river, which was the highway of those days, but also that they might have the diversity of meadow and woodland for some distance back from the river's edge. In addition to these natural advantages, the early settlers were obliged to band together for the defence of their homes from the attacks of hostile Indians, and the closer the proximity of their houses, the greater the mutual assistance in the hour of peril and need. These seignories were tracts of land varying from half a league to six leagues in length along the river, and of a depth of one or two leagues. These were granted by the French king to military officers who had rendered valuable service in the colony. These tracts of land were again divided into the small parcels which have just been referred to. The feudal principle of homage was the condition of the seignior's tenure of the land, while the *habitant* or cultivator of the soil must render his service in a rental, payable in money or produce or both. This condition lasted until 1854, when it became apparent that this system was unsuitable to the changed conditions and the larger population, and the last relic of the feudal system was abolished. At that time there were about one hundred and sixty seigniors and about seventy-two thousand *rentiers* or cultivators of the soil.

Public lands.

The lands not yet surveyed, or, if surveyed, not yet allotted to settlers and lying within the boundaries of the respective provinces, are the public lands of such provinces. Certain reservations exist in the case of the provinces of Manitoba, Saskatchewan and Alberta and in the territories of Canada, and also a tract of 3,500,000 acres in the province of British Columbia. These lands remain the public lands of the Dominion of Canada and may be disposed of by the Dominion government for various purposes. Prior to the construction of the Canadian Pacific railway a grant of 25,000,000 acres of land was made to the company in addition to a cash subsidy for the construction of the railway. On the incorporation of the Grand Trunk Pacific railway in 1905, no land-grant was made to the Company, although it passed through territory precisely similar to that through which the Canadian Pacific passed, and the expressed policy of the government on that occasion was that no further grants of public lands should be made by way of subsidies to railways but that such lands should be conserved for the people of the Dominion.

In addition to the lands thus held by the Canadian Pacific railway, the Hudson Bay Company is owner of extensive tracts of land in what is known as the "fertile belt" and conveyed to this Company on the surrender to the Crown of the vast corporate rights held by that Company.

In every township surveyed in the Dominion lands, two sections are absolutely reserved and set apart as an endowment for purposes of education, and on being disposed of the proceeds of the sales are invested ; and the interest derived from such investment is paid annually to the province or territory within which such lands are situated for the support of the public schools in such province or territory.

Apart from the lands held by the Canadian Pacific railway and the Hudson Bay Company, and the lands reserved for school purposes, all Dominion agricultural lands, as soon as surveyed, are open for purchase at such prices and on such terms and conditions as may be fixed from time to time by the government, but no sale to any one person shall exceed 640 acres unless in special cases by the consent of the government. With the object of further enhancing the value of the public lands, the government reserves the right to retain alternate sections in any lands offered for sale.

All arid lands unsuited for cultivation without the aid of irrigation may be withdrawn from sale or settlement and may be disposed of in tracts of sufficient size to warrant the cost of providing an irrigation system, but subject to the terms and conditions as to colonization and settlement and as to the cultivation thereof by the aid of irrigation as the government may impose.

Homestead laws.—Every person who is the sole head of a family and every male of eighteen years of age may secure homestead entry for land not exceeding 160 acres in surveyed agricultural lands, but this right does not extend to lands valuable for timber growing thereon or on which there is marble or coal or other mineral having a commercial value, or on which there is water-power suitable for manufacturing purposes, the homestead entry being limited strictly to agricultural lands only.

A nominal fee is charged for recording the entry, and at the expiration of three years from the entry the settler, if he is a British subject by birth or naturalization, or his legal representatives in the case of his death, shall, upon satisfactory evidence being shown that he has resided on the lands and cultivated them for the three years since his entry, be entitled to a patent vesting the lands in him as owner. This period of three years between the entry and the granting of the patent may be shortened by the payment to the government of the price fixed by the government for these lands, and a patent is forthwith granted.

The rights of a settler in the homestead lands are not assignable until it has been satisfactorily shown that the requirements entitling the settler to a patent have been compiled with and the granting of a patent has been recommended.

If ten or more members of an association of settlers desire to engage in coöperative farming, they may, on complying with certain specified regulations, secure the right to make their preemption entry on a block of lands to be selected, but in no case shall the individual right of entry exceed 160 acres; and the strict requirement of residence on this preëmpted land may be waived, and residence within a hamlet or village within the boundaries of the tract so set apart will be regarded as tantamount to actual residence on the lands.

Mention has already been made of the limitation of homestead entries to agricultural lands. The government further reserves in every grant of land, whether by homestead entry or otherwise, all gold and silver mines on the said lands, whether the presence of such mines is disclosed at the time of the granting of the patent or not.

Mining lands.—No mining lands, whether of coal or other minerals, are offered for sale or for homestead entry, but such lands remain in the hands of the government, and the leasing, licensing or other disposal of such lands is dealt with under special regulations pertaining to such lands.

Grazing lands.—Unoccupied public lands, suitable for grazing, may be leased for a term of years, on such rent and subject to such other terms and conditions as may be imposed by the regulations authorized from time to time by the government.

Woodlands.—In the survey of townships which consist partly of prairie and partly of timberland, the timberlands shall be divided into woodlots of not more than twenty or less than ten acres, and, as far as practicable, so as to afford one such woodlot to each prairie farm of 160 acres. These woodlots shall be apportioned to each quarter section (160 acres) not having on it more than ten acres of wood, and the settler shall pay for such woodlot the price fixed by the government, and on the patent of the quarter section to which such woodlot is annexed being granted, a patent of the woodlot shall likewise be granted.

Forest reserves.—Large tracts of Dominion public lands and also large tracts of land in the various provinces have been withdrawn from settlement, sale or occupancy by the respective governments for the purpose of maintaining and protecting the timber now growing, or which may hereafter grow thereon, for the protection of the animals and birds therein and the fish in the waters in such reserves, and for the maintenance of conditions favorable to a continuous water-supply. Forest rangers are appointed whose sole duty it is to enforce the provisions of the various legislative enactments having these objects in view, and also to patrol the reserves to guard against the destruction of any part of the reserves by fire.

Indian lands.—Certain defined tracts of lands have been set apart by treaty or otherwise for the benefit of the various bands of Indians inhabiting Canada. These lands are under the control and management of the government, and the rights of the Indians within such reserves are zealously guarded and protected. The title to these lands remains in the Crown, but the lands and all wood, timber, stone, minerals, metals and everything pertaining to the land, are held in strict trust by the government for the benefit of the Indians located on such lands. No railway, road or public work, with the widest powers of expropriation, may take any part of the reserve without the consent of the government first being obtained, and any compensation for such lands expropriated is held on the same trusts as the land itself. No person can acquire any rights to the lands comprised in the reserve unless he be a member of the band of Indians located on the reserve, nor is any person permitted to trespass on the lands of the reserve for any purpose, whatsoever; and no sale, barter or exchange is permitted with persons outside the reserve without the authority of the Superintendent-General of Indian Affairs. Within the reserve an Indian may choose a location with the approval of the council of the band of Indians and of the Superintendent-General of Indian Affairs, and thereupon is entitled to possession of such location until his certificate thereto is canceled. No sale of such location to any person not a member of the band is permitted, and the property may be devised only to persons residing within the reserve; and if such locatee should die intestate, his property shall descend only to such of his heirs as are actually resident on the reserve.

The lands comprised in these reserves may be surrendered to the Crown by the assent of a majority of the male members of the band over twenty-one years of age, at a general meeting summoned for that purpose and afterwards approved of by the government. On such surrender, the lands may be opened for settlement as in the case of other Crown lands.

General statement.—As has been already stated, the owner of lands may, by sale, gift or exchange, dispose of his lands during his life and by will to take effect after his death. In general, the principles of law applicable to the title and transfer of land follow the English law, and the precedents established in that country are followed in Canada. In case no disposition of land is made by will, the law of descent declares who the heirs shall be, and in the absolute failure of heirs, no matter how remote, the title escheats to the Crown.

Since 1884, the various provinces have passed laws dealing with the rights of married women, the general result of which is that the former disabilities of married women to hold land free from the husband's rights therein have entirely disappeared, and a married woman may hold land and dispose of it independently of her husband.

In the province of Ontario, the devolution of land on the personal representative of the deceased instead of the heirs of the deceased, and the treatment of this species of property in precisely the same manner as if it were personal property, has effected a radical change in the distribution of estates of deceased persons. No restrictions are placed on aliens being the owners of lands, and corporations are allowed to hold in the corporate name sufficient lands for the purposes of the corporation, but not to any greater extent.

Gifts of lands may be made to charitable institutions by deed but not by will, and in the case of a gift not contravening the statutes of mortmain, it can be held only for a specified period, when it must be sold.

RENT AND PROFITS IN AGRICULTURE

By *H. C. Taylor*

Labor and land are the primary factors in production. Certain expenditures are required to maintain these factors in good condition for productive purposes. The owner of a rented farm is usually able to command for its use a surplus income over and above that required to maintain the farm in the same state of fertility, to maintain the buildings, fences and implements, and to pay interest on the investment in the improvements. This surplus income is called the *rent* of the land. It is likewise true that a farmer operating a hired farm is usually able to secure an income greater than that required to support himself and family, to pay all operating expenses (including maintenance of equipments, interest on investments, and the wages of the hired laborers) and compensation to the landlord. In such a case, this surplus is called *profits*. It is the purpose of the following paragraphs to outline the forces and conditions which (in a community where private property in land, freedom of contract, and free and intelligent competition exist) tend to determine the amount of rent paid for the use of any given grade of land, and the amount of profits realized by any given grade of farmers.

The theory of rent.

The motives that underlie the actions of men when bidding for the use of land are fundamentally the same as those that operate in determining the values of other useful things. The theory of rent is, therefore, an attempt to indicate the way in which the theory of value works itself out when applied to the annual value of land.

In order to command rent, land must be both useful and scarce. Land of the highest degree of fertility and in the best location would not command rent if it were in such great abundance that, after everybody used all he cared for, there was still land of this grade unused. It is equally true that land must be useful, either as a basis for producing wealth or for some other purpose, if any value is to be placed upon it.

While all land that is useful and scarce is valuable, all such land is not equally valuable, for the simple reason that all land is not equally useful. This variation in usefulness may be due to variations in the fertility of the land or to differences in the location of the land with respect to the market for the goods produced. Economists have usually thought of the least desirable land in use at a given time as being rent free. That is, it is assumed that the least desirable land will be in great abundance relative to the demand for such land, and, therefore, that no rent will be paid for its use. This "no-rent" land is then taken as the starting point for measuring the rent of the more useful grades of land. According to the Ricardian theory, the rent of any given grade of land is measured by the difference in the value of the produce resulting from a given outlay of labor and capital on that land, and on the no-rent land. For example, suppose a farmer can, with the same effort and expenditure, produce goods worth:

TABLE I.

On first-grade land	$1,000
On second-grade land	900
On third-grade land	800
On fourth-grade land	700
On fifth-grade land	600
On sixth-grade, or no-rent land	500

The assumption is that, if all these grades of land, and no more, are needed to supply the market, competition will tend to make the rent of the requisite quantity of fifth-grade land $100, that of fourth-grade $200, that of third-grade $300, that of second-grade $400, and that of the first-grade $500. This is thought to be true because the farmer can as well afford to pay these sums as use the no-rent land.

While this theory of rent has long born the name of Ricardo, it was James Anderson who first stated it. Ricardo amplified Anderson's statement of the theory, and still further amplifications are needed. The theory as stated above satisfied the economists who were discussing rent in its relation to prices and taxation. They were more interested in the characteristics of rent as a surplus product after payment of wages and interest, than in the exact quantity of rent paid for a given piece of land. Anderson found the explanation of the differences in the amounts of rent paid for the different pieces of land in the variations in the fertility of these pieces of land. Ricardo accepted Anderson's method of statement and added to the influence of variations in fertility the influence of variations in the location of land with respect to the market, and recently our attention has been called to the influence of variations in the efficiency of the farmers who compete for the land, upon the amount of rent that will be paid for its use. This latter influence will receive special attention in this article.

The theory of profits.

Many economists have ignored variations in the efficiency of farmers, manufacturers, and men of commerce, but others, following Walker, adhere to a theory of profits analogous to the Ricardian theory of rent. They believe that all farmers are not equally efficient, and that the farmers who, because of their better judgment and greater skill, manage their farm operations better than their competitors are able to secure larger returns from the same expenditures for labor and equipment on the same grade of land. These economists would assume the returns given for the various grades of land in the above illustrations to be the product of the least capable farmer needed to supply the demand for agricultural products, and that the farmer whose ability is superior to that of the least capable farmer will be in a position to secure a profit. The profit of a given farmer will be measured, it is said, by the difference in the value of the product that he can secure and the value of the product secured by the least capable farmer, with a given outlay on a given grade of land. For example, suppose that with a given outlay on no-rent land (that is, on the least useful land needed to supply the demand for agricultural products) the value of the product secured by the different grades of farmers is as follows:

TABLE II.

Farmer A	$1,000
Farmer B	900
Farmer C	800
Farmer D	700
Farmer E	600
Farmer F	500

The assumption is that, if the produce of all these grades of farmers, and no more, is in demand, F will just be able to pay expenses, including a living for himself and his family, but E can retain a profit of $100, D $200, C $300, B $400, and A $500, because the more efficient farmers secure larger returns in value, as a result of the same outlay, than does the marginal farmer. This larger return may be due to the ability of a more efficient farmer to secure more produce of the same quality, or to produce a better quality of products, or at the same time to produce more and of a better quality.

It should be noted that it is profit per unit of the combined factors of production that is here considered. It is doubtless true that there are great variations in farmers with regard to the number of units of land labor and equipments that they can successfully operate, and if one of two farmers of the A grade is able to operate a larger farm than the other and do it just as well, that is, secure as large returns per unit of investment, this would give rise to a difference in their total profits, though their profits per unit of expenditure would be the same. This means simply that there are differences in men with respect to the quantity of work they perform, as well as with respect to the quality of their work. The former may be called quantitative efficiency, the latter qualitative efficiency.

Important considerations affecting theories of rent and profits.

These theories of rent and profits point in the direction of the truth, but fall short of an accurate statement because they leave out of account at least three important considerations, namely, (1) the influence of variation in the qualitative efficiency of farmers on the amount of competitive rent; (2) the influence of variations in usefulness of land on the amount of profits, and (3) the influence of the variation of the usefulness of equipments and of hired laborers on rents and profits. Each of these points may, to advantage, receive our attention.

First, the amount of rent is influenced by the variation in the qualitative efficiency of the farmers. In the foregoing illustration, it was assumed that the rent of a given piece of land was measured by the difference in the value of the product secured (as a result of a given outlay made by the least efficient farmer) on that land and on the no-rent land. But it is a fact that has long been recognized by the more intelligent farmers, that the rent of a more useful grade of land is often far more than the marginal farmer can afford to pay for its use. This condition arises out of the fact that the product due to the superior ability of the farmer who is qualitatively more efficient is greater when he farms the more useful land. For example, farmer A is twice as efficient as farmer F, that is to say, with the same land and equipment he can secure 100 per cent more products. It is certainly true, for example, that this extra product will be worth more if grown on the land near the market where prices are high than if grown on the land less favorably located. This supplies the motive to the more efficient farmers for trying to secure the most productive land and for outbidding the less efficient competitors for its use. As a result, the rent of the better grade of land will tend to be appreciably greater than the difference in value of the product that the marginal farmer could produce on these grades of land, and the value of what he can produce on the no-rent land.

Second, the amount of profits is influenced by the fact of variations in the usefulness of land. As above stated, the extra product that the farmer of superior ability is able to secure, over what the marginal farmer can secure, is greater on the more useful land than on marginal land. It is necessary to pay a part, but only a part, of the value of this extra product as rent in order to force the less efficient farmers from the better grades of land, and to enable the most efficient farmers to secure the most productive land; hence, the profit of the superior farmer is greater than it would be if all land were of the same grade as marginal land. The reason for this will become more obvious in the illustration that follows.

Third, both rent and profits are influenced by the fact of variation in the usefulness of the equipment of the farm. It is a commonplace fact that all horses are not equally useful for a given purpose, that one cow will yield much more milk, butter, or cheese than another, receiving the same care and feed. In the same manner, as it is true that the most efficient farmer can secure the highest profit for himself on the most useful land, after paying more for the use of such land than his less efficient competitors can afford to pay, it is true that the most efficient farmers can afford to pay the price and employ the best grades of equipment. That is, the most efficient cow, handled by the most efficient dairyman, on the most useful dairy land, will yield greater returns in value than a less efficient dairyman, on less useful land, would be able to secure from the same cow. As a result, the more efficient farmers can pay more for the useful grades of equipment than their less efficient competitors can afford to pay, and still secure a larger profit than they could secure by operating less useful grades of equipment. The same proposition is true regarding the employment of hired laborers. There is an economic motive, therefore, that tends to associate the most productive grades of all the factors of production, land, farmers, laborers, and equipment. In turn, the least productive grades of all the factors tend to be associated, and likewise the various gradations between the least and the most productive. This combination results in: (1) a higher rent for the most useful land; (2) a higher valuation placed on the most useful grades of equipment; (3) a higher wage for most efficient employees; and (4) a higher profit to the most efficient farmer, than could result from any other combination of these grades of the factors of production.

We shall here direct our attention especially to the influence of these variations in the usefulness of the factors on rents and profits.

Influence of variations on rents and profits.

Since complex mathematical formulæ would be necessary, should we attempt to handle more than two variables at once, we shall combine the expenditures for labor and for the use of equipments into a fixed unit of expenditure in value. In so doing, we throw into the background the forces and conditions that determine the cost of labor and of equipments. To illustrate the way these forces will tend to determine the amount of rent and profits, let the figures in the following table represent the value of the gross product that the farmers of the respective grades can produce as a result of an outlay of five hundred dollars for labor and for the use of equipments, our fixed unit of expenditure, on the different grades of land. It will be assumed, in this illustration, that the more efficient farmers always invest the given outlay in the more productive forms of labor and equipments. In order to make this and the foregoing illustrations include the element of variation in intensity of culture, we have taken a fixed outlay for labor and for the use of equipments, instead of a fixed area of land. If, therefore, 100 acres be the area of sixth-grade land on which this expenditure is made, less than 100 acres of the more useful grades are likely to be cultivated with this same outlay, for it is usually true that the more useful the land, the more intensive the culture that is most profitable.

It is here assumed that the F-grade farmer, when operating sixth-grade land and a corresponding grade of labor and equipment, will just be able to make a living without paying any rent for the use of the land. In other words, we have here a no-profit farmer operating no-rent land. On a basis of the figures in Table III, the F-grade farmer can afford to pay $100 as rent for the quantity of fifth-grade land on which he would make the same outlay as on 100 acres of sixth-grade land, for, instead of a product worth $500, he would there be able to secure a product worth $600. Following the same reasoning, the F-grade farmer could afford to pay $200 for the fourth-grade land, $300 for the third-grade land, $400 for the second-grade land, and $500 for the first-grade land.

When all the grades of land are viewed from the standpoint of the A-grade farmer, it becomes apparent that he can make a profit on land of any of these grades, and that he would do as well to pay a rent of $200 for the use of the fifth-grade land, $400 for the use of the fourth-grade land, $600 for the third, $800 for the second, and $1,000 for the use of the first-grade land, as to farm the sixth-grade land rent free. But is there a competitor who will make the A-grade farmer pay the price? This we must ascertain by studying the interests of the competitors.

The E-grade farmer is able to produce $600 worth of products on the sixth-grade land, leaving him a profit of $100. It can not be expected that he will be willing to accept less profit from land of any other grade. He can pay $120 as rent for the amount of fifth-grade land on which the same outlay is made as on the 100 acres of sixth-grade land, and retain the same profits, $720 − ($500 + $100) = $120. But the F-grade farmer can bid no more than $100 for the use of the fifth-grade land, and, so far as he is concerned, the E-grade farmer can have the fifth-grade land for anything over $100, and can give a balance to turn the bargain. Let us, in this illustration, figure that he will pay $105. This will leave him a profit of $115. $720 − ($500 + $105) = $115. In bidding for the fourth-grade land, he could not be expected to accept a smaller profit. His gross income on fourth-grade land is $840. This, minus the $500 outlay and the $115 profit that he could make on fifth-grade land, leaves $225 as the maximum rent that the E-grade farmer can bid for the fourth-grade land.

When the rent of fifth-grade land is

TABLE III.

Grade of farmers	Grades of land						Profits
	First	Second	Third	Fourth	Fifth	Sixth	
A	**2,000**	1,800	1,600	1,400	1,200	1,000	775
B	1,800	**1,620**	1,440	1,260	1,080	900	580
C	1,600	1,440	**1,280**	1,120	960	800	405
D	1,400	1,260	1,120	**980**	840	700	250
E	1,200	1,080	960	840	**720**	600	115
F	1,000	900	840	700	600	**500**	000
Rent	725	540	375	230	105	000	

Note that in Table III the figures representing the product of the F-grade farmer on the different grades of land are the same as in Table I, where the Ricardian theory of rent was illustrated. Note also that the figures representing the product of the various grades of farmers on sixth-grade land are the same as those used in Table II, where Walker's theory of profits is illustrated. And note further that the remainder of this table is the result of simply following out logically the assumption in the two preceding tables. That is, in this table, instead of stopping with a statement of the variations in the product of the different grades of land when farmed by the F-grade farmer, and a statement of the variation of the product of the different grades of farmers on the sixth-grade land, we here give a statement of the product which each grade of farmers could produce upon each grade of land, also the rent and the profits which would be approximated in the case of free competition among the different grades of farmers for the various grades of land.

$105, the D-grade farmer can secure a profit of $235 on that grade of land. $840—($500 + $105)=$235. He could secure this same profit on fourth-grade land and pay a rental of $245 for its use. $980—($500 +$235)=$245. But so far as the competition of his inferiors is concerned, any amount over $225, let us say $230, is all the D-grade farmer need pay for fourth-grade land. This will leave him a profit of $250, $980—($500+$230)=$250, which is $15 more than he could make on fifth-grade land at the rent the E-grade farmer is willing to pay. To secure the same profit on third-grade land the D-grade farmer can not pay more than $370 for its use; $1,120—($500+$250)=$370. But the C-grade farmer, whose profits on fourth-grade land at a rental of $230 would be $390, $1,120—($500+ $230)=$390, can secure the same profit from third-grade land after paying $390 as rent, $1,280 —($500+$390)=$390. It will be profitable, therefore, for the C-grade farmer to outbid the D-grade farmer for the use of the third-grade land by paying $375, for this will leave him a profit of $405; $1,280—($500+$375)=$405. To secure the same profit on second-grade land, the C-grade farmer can bid no more than $535 for its use; $1,440—($500+$405)=$535. But the B-grade farmer whose profit on third-grade land at a rental of $375 would be $565, $1,440—($500+$375)=$565, can secure the same profit from second-grade land after paying a rental of $555 as rent; $1,620—($500+$565)=$555. It will be profitable for him, therefore, to outbid the C-grade farmer for second-grade land by paying $540. This will leave him a profit of $580; $1,620—($500+540)=$580. The B-grade farmer could pay no more than $720 for the use of the first-grade land and retain this same net profit; $1,800—($500+$580)=$720; but the A-grade farmer can pay any amount up to $740 for first-grade land rather than take second-grade land at $540, for his profit on second-grade land would be $760; $1,800—($500+$540)=$760, and $2,000—($500+$760)=$740. As $720 is the most any other competitor can pay for the use of first-grade land, the A-grade farmer can secure this grade of land for a fraction over that amount, let us say, $725, and retain a profit of $775.

It is a matter of common observation that competition tends to distribute the farmers on the different grades of land in accordance with their efficiency, the A-grade farmer on the first-grade land, the B-grade farmer on the second-grade land, and so on. The fact that each grade of farmers can win a larger profit on the grade of land that corresponds to their degree of efficiency is the force that tends to bring about this condition of affairs. But it is not the individual farmers alone who are benefited as the result of the working out of this tendency. The combination of the productive forces that puts the most useful agents of production into the hands of the most efficient farmers results in the largest total production of economic goods for the country as a whole.

These points may be illustrated by use of Table III. Let the reader calculate the profits that each farmer could make on the various grades of land and it will become more clear that competition makes the rents of the various grades of land such that the farmer's profit is the greatest on the land to which his grade of efficiency adapts him. Again, let the reader calculate the total value of the product of all grades of land when the A-grade farmer is on the first-grade land, the B-grade farmer on the second-grade land, and on down the list. ($2,000 + $1,620 + $1,280 + $980 + $720 + $500=$7,100.) Then let him try any other combination, and it will be found that no other combination of the grades of farmers and land will result in so large a total product.

In actual practice, it is evident that custom, sentiment, and lack of knowledge retard the operations of the economic forces, to the detriment of individual and national well-being. Yet the fact has long been recognized that the farmers who are qualitatively the most efficient do actually tend to get the best grades of land and equipments.

Conclusions.

The effort has been, in this article, to make a statement of the forces and conditions that tend to determine the amounts of rent and of profits under conditions of free and intelligent competition. The viewpoint is more that of the ideal in production than that of a faithful description of all the complex forces and conditions, such as customs, sentiment, and ignorance, as well as competition. The aim has been rather to indicate to the practical man the direction in which to expect a legitimate increase in rent or profit.

This analysis of the forces of distribution forms the basis for drawing some significant conclusions. First: It makes a difference which grade of land the farmer chooses. The farmer who is qualitatively the most efficient can secure the highest profits from the land that is most useful for his lines of production. This is likewise true of his labor and equipments. Second: All farmers of superior ability may save from their profits and thus get ahead in the world, i. e., the "iron law of wages" operates, if at all, only for the marginal farmer. Third: The farmer can make use of the highest degree of skill and knowledge without fear that the landlord will be able to take, in the form of a higher rent, all of the extra product due to more efficient management.

Literature.

The writings on the theory and practice of rents and profits are very numerous. The general reader will find the subject well discussed in the following places: David Ricardo, Principles of Political Economy and Taxation, Chapter II; J. S. Mill, Principles of Political Economy, Book II, Chapters XV, XVI; F. A. Walker, Political Economy, Part IV, Chapter IV; A. Marshall, Principles of Economics, Vol. I, Book VI, Chapter IX (Second Edition); C. N. Carver, Distribution of Wealth, Chapter V; E. R. A. Seligman, Principles of Economics, Chapters XII, XIII; J. R. Commons, Distribution of Wealth, Chapter III; Richard Jones Distribution of Wealth, Part I.

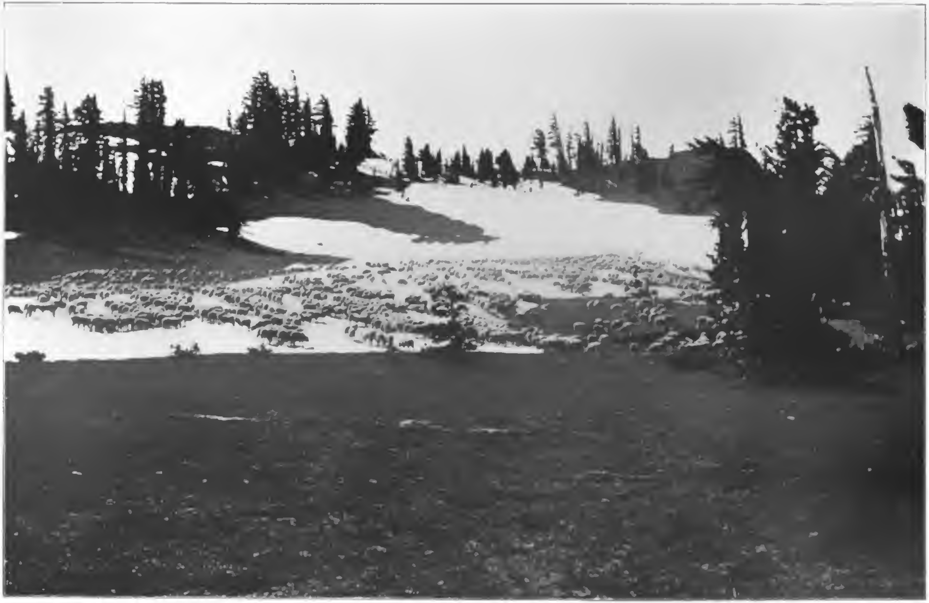

Plate X. The mountain pasture ranges. Band of sheep on snow on Van Buren's range, Mt. Lola, California

AGRICULTURAL LABOR

By *L. G. Powers*

Man's agricultural labor at the beginning must have been identical in character with that of the so-called agricultural ant. He removed weeds from self-sown fields of grain, and gathered and stored the products to secure a supply of food for the changing seasons of the year. All work was performed without implements, and the results were poor as compared with those accomplished at a later day.

The introduction of implements.

Man's work was differentiated from that of the ant when he began to use tools for tilling the soil and planting crops. The first implement adapted for these purposes must have been a crooked stick, or a stick with a projecting limb, which could be forced into the ground with the aid of the hands and foot, or with the hands alone. Such sticks were the first spades and hoes. They did not immediately add much to the efficiency of agricultural labor, but their use in loosening the soil and preparing it for the reception of seeds had within itself the germ of all modern inventions, and opened the way for all later agricultural progress.

A strong stick with a projecting limb constituted the first hoe, and the same stick operated in a reverse manner became the prototype of the modern plow. The first plows were drawn by human hands, but later ones utilized the domestic animals in stirring the soil for the reception of seed. With plows wholly constructed of wood, animals at first could add but little to the efficiency of human labor, and hence that efficiency long continued to be of a low degree.

With the discovery of the art of working in copper and iron, an edge was provided for the spade and hoe, and the effectiveness of farm labor greatly increased. At the same time, a point or share was added to the old wooden plow, and domestic animals became efficient helpers in working the soil. With the axe, man laid low the giants of the forests, converted the trees to his uses, and turned the places where they stood into fields for raising his food and keeping his ever-increasing flocks and herds. The scope of farm activity was widened. At first only the lightest and poorest soils were tilled, since only such could be broken up by the early wooden spade, hoe, and plow. With the successful application of an iron edge, stronger and keener implements were employed, and agricultural labor became doubly effective as the result of deeper and more perfect tilling and from the cultivation of newer and more fruitful fields.

Early agricultural labor in the United States.

The pioneers of the United States expended a great proportion of their labor in clearing the wilderness and opening the land of the new world to agriculture. For every day's labor expended before 1800 in the growing of crops, it is very probable that one if not two others were utilized in cutting down the forests, clearing away the stones, building houses, barns, and fences, breaking up the primitive sward of the prairies, opening roads, constructing bridges, and, in short, in mastering the wilderness and making it ready to blossom with the rose and gladden the heart of the husbandmen with its abundant and never-failing crops. With agricultural labor thus employed the harvests for a long time barely sufficed to feed and clothe the farm population. Agricultural exports were relatively unimportant, and the non-agricultural workers constituted but a small proportion of the total population. In 1800, the urban population, or people residing in cities having more than 8,000 inhabitants, were only 4 per cent of the total. In 1820, when the census first collected data relating to occupations, the corresponding percentage of urban population was only 4.9; while those engaged in agriculture constituted 83 per cent of those whose occupations were reported, and their ranks included at least 80 per cent of those employed in all gainful occupations. The average farm family produced only enough materials for food and clothes for its own use, and for an excess that would supply one-fourth the wants of an average city family. In other words, the excess provided by four farm families sufficed only to meet the wants of a single family subsisting by labor other than agricultural.

The situation disclosed for 1820 was probably not greatly variant from that existing in 1800, as is evidenced by the slight change that took place from 1800 to 1820 in the percentage of urban population. From 1800 to 1850 a very great change took place in the relative number of agricultural workers and agricultural families, in the aggregates for the nation. Many improvements were made in farming implements. The cast- or wrought-iron, or the steel plow, took the place of the old wooden plow faced with a small piece of iron. The proportion of labor applied to clearing the forest decreased, and that devoted to cultivating the soil increased. As a result, the average productivity of agricultural labor became greater.

Increasing productivity of agricultural labor in United States.

Before attempting to measure this added productivity, it should be noted that the statistics of occupation are, in some respects, less complete for 1850 than for 1820. They give the occupation only of the free males. Combining the information contained in the statistics mentioned, with that given in the statistics of population, it is computed that the male workers, and thus the farm families, constituted not far from 55 per cent of the total male workers and total families of the nation. The relative decrease in the number of farm families was accompanied by an actual and relative increase of the strictly urban residents, that changed their proportion of the total national population from 4 per cent in 1800 and 4.9 per cent in 1820, to 12.5 per cent in 1850. The increase in the efficiency or productivity of farm labor already noted sufficed to feed the larger actual and relative number of urban dwellers and other non-agricultural families, and to provide greater total and per capita agricultural exports.

Disregarding the increased exports, and measuring the increased productivity of farm labor by the number of people in this country for whom the the labor of one agricultural family provided food and the materials for clothes, it is found that while in 1800 and 1820 the surplus farm products of four agricultural families barely sufficed to support one non-agricultural family, in 1850 the labor of the three agricultural families furnished the food and the materials for clothes for themselves, and was more than sufficient to supply those for two nonfarm families. During the years between 1800 and 1850 there was no material change in the standard of living, character of clothes worn, or food consumed, so that, with the exception of the error involved in disregarding the increased agricultural exports, which consisted largely of cotton and tobacco, the relative change in the number of agricultural families becomes a fairly correct measure of the increased productivity of farm labor. The facts passed in review indicate, therefore, that the average farm family produced food and materials for clothes in quantities that were not far from 50 per cent greater in 1850 than in 1800.

The relative productivity of American farm labor increased far more between 1850 and 1900 than in the preceding half century. The extent of this increase may be measured in many ways. One of these is to compute the number of pounds of the great staple crops grown by the average male worker or agricultural family at the beginning and at the close of the period. Turning to the census for the data to make such a comparison, it is found that in 1849 there was raised on American farms, of grain crops—hay, potatoes, sweet-potatoes, cotton, and tobacco—an aggregate of 80,672,000,000 pounds; while in 1899, the farmers produced 410,307,000,000 pounds. Disregarding the minor crops, for which there are no comparative data, but whose production increased faster than that of the crops mentioned, the agricultural products measured in pounds was 5.1 times as great in 1899 as in 1849. The corresponding increase in the cereals was 5.0; hay, 5.8; potatoes, 4.1; cotton, 4.9, and tobacco, 4.3. During the period that witnessed this increase in agricultural production, national population increased only 3.3 times.

The farm population, or families living by agricultural labor, doubtless increased in proportion to the male agricultural workers. From an analysis that he made of the population and occupation data, the writer computes that in 1850 the number of these workers, free and slave, over sixteen years of age, was not far from 3,500,000. The census in 1900 reports 8,549,739 of the same sex and age. The agricultural families and toilers increased, therefore, in fifty years to only 2.44 times their earlier number, while the principal products of their labor increased in weight 5.1 times. In 1850, the average male farm worker of the age mentioned produced a total of 23,050 pounds of the crops named, while fifty years later he produced 48,000 pounds, or over twice as much. To this extent, at least, and probably to a still greater one, did the effectiveness or productivity of farm labor increase.

As a result of this increased productivity, the farmers were able to provide food and materials for clothes for their families, and also for the support of an ever-enlarging urban and other nonfarming population. The urban population, which in 1800 constituted only 4 per cent, and in 1850 12.5 per cent, of the total, in 1900 had become 33.1 per cent of the national population; and the non-agricultural families, which, in 1800, were one-fifth, in 1900 were at least three-fifths of the whole. By the increased productivity of farm labor, the agricultural toilers in 1900 could not only supply this increased non-farm population with all the food that it required, and provide the materials for its clothes, but they were also able to export agricultural products in quantities undreamed of in the earlier days.

This great increase in the productivity of American farm labor was brought about in large part by the greater and more effective utilization of the labor of horses and mules in the operation of new and improved farm implements and machinery. This utilization is shown in part, and yet only in part, by the changed number of work animals on farms. In 1850, the number of horses one year old on those farms in the United States was 4,333,719; and of mules and asses, 559,331. In 1900, the corresponding numbers were, horses 16,952,191, mules 3,032,987, and asses 94,185. The total number of these animals in the earlier year was 4,896,050; in the latter year, 20,079,363. These animals increased in number 4.1 times, while the increased productivity of the great staples already mentioned was 5.1 times. The difference measures the improvement in the strength and working power of the average horse or mule. With improved and larger horses, the farmers were able to accomplish their increased work with fewer animals than otherwise would have been required, and a smaller portion of the total product was consumed for horse feed than would have been reqnired but for this change. In this way, an added gain accrued to agricultural labor in the United States.

Relative productivity of agricultural labor of different countries.

No article dealing with farm labor would be complete that did not consider the relative effectiveness or productivity of such labor in different countries. Mulhall, in his Dictionary of Statistics, issued in 1899, giving the latest figures then available, makes the statement that, "In the United States 9,000,000 hands raised nearly half as much grain as 66,000,000 in Europe. Thus, it appears that . . . one farm laborer in the United States is worth more than three in Europe." The reason for the greater average productivity of agricultural labor in the United States, to which Mulhall calls attention, is due to the greater utilization of the energy of work animals in America, as is evidenced by the following summary:

At the last census there were on the farms of Austria 1,606,149 horses, mules, and asses; on those of Great Britain and Ireland, 2,040,330; of France, 3,466,260; while in the German empire in 1897 there were 4,038,485. The latter has an agricultural population nearly as great as that of the United States, and of the European nations mentioned it possesses the largest actual and relative number of horses and mules; yet, in 1897, it had only one-fifth as many as had the United States, while Great Britain and Ireland owned one-tenth and Austria one-thirteenth as many.

The United States, according to the foregoing exhibit, has an agricultural advantage over Germany represented by the physical power of 16,000,000 horses. The corresponding superiority over Great Britain and Ireland equals the strength of 18,000,000 of these useful animals. Let these facts be stated in words that will convey, if possible, more of their significance:

The power of the average horse, or its ability to work, is usually estimated as equal to that of six men. To allow for the time that it is unemployed, it is here rated as that of five men. The 16,000,000 horses and mules on American farms in excess of those in Germany, according to the foregoing estimates, can exert a muscular force equal to that of 80,000,000 adult human beings, or the male workmen in an agricultural population of 300,000,000. This greater actual number of horses enables the 10,438,219 workmen in America to raise as many pounds of agricultural products as the 26,000,000 or 28,000,000 in Germany. The American farmer is so assisted by the horses that he is able to accomplish from three to three and a half times as much as his competitor in the realm of William III.

The 30,000,000 people who now reside on the farms of the United States therefore equal in productive power an agricultural population of over 100,000,000 toiling under the conditions that exist along the Rhine. The profits of the American farmers above those of Germany represent the living expenses of over 70,000,000 of people, less the cost of shipping their food and clothes from the Mississippi valley to Berlin and Hamburg.

With the data already given, with reference thereto, simple calculations will suffice to show the advantage that agricultural labor in the United States holds over that of the other European countries, by reason of the greater number of work animals it utilizes, and will thus disclose the cause of the greater productivity to which the eminent statistician, Mulhall, has called attention.

Social and economic changes in the organization of agricultural labor.

Mention has already been made of the increase in the efficiency of labor on American farms that took place between 1850 and 1900. That increase was accompanied by profound changes in the social and economic organization of farm labor; changes that have influenced, and in turn been modified by, such productivity. In 1850, there were 3,204,313 slaves in the United States, of which the greater number were employed in some capacity on the farms. The number of male slaves over fifteen years of age was 874,514, of whom not far from 800,000 were engaged in some branch of agricultural work. In the period following the war, 1861 to 1865, these and all other slaves were given their freedom, and in the organization of agricultural labor that followed, they and their descendants, if remaining on the farm, became wage-earners or tenants.

The passage of the Homestead Act in 1862, and the consequent opening of free farm lands in the West, rendered it increasingly difficult for the farm owners in the North to obtain hired labor, and the proportion of such labor decreased. Some of the men who were unwilling to toil longer for wages became farm owners in the West, and others became tenants. As a result of this change and the one mentioned in the preceding paragraph, the number of farm tenants had so increased by 1875 that the Tenth Census, in 1880, was authorized to collect data relating to farm tenure. Similar data have been collected in each succeeding census year. The information thus secured, when combined with that relating to occupation, record the changes that have taken place in the organization of labor on American farms since 1850, although all statements relating to such labor in 1850 must be made with a considerable allowance for possible error, owing to insufficient data.

In 1850, the number of males employed in agricultural labor on American farms was not far from 3,500,000. At that time, the farms numbered 1,449,073, some of which — about 6 per cent or 85,000—were operated by women owners, as has been the case in all subsequent years. A small number were, however, conducted by tenants. This was notably the case in New York, where feudal tenure was not brought to a practical close until after the adoption of the Constitution of 1846. The number of farm tenants in the nation could not have been less than 100,000 and may have exceeded that number. The males over fifteen years old on farms, other than farm owners, tenants, and slaves, must have equaled 1,335,000 in number. None of the foregoing figures can be given with anything more than an approximation to exactness. They indicate, subject to the limitations mentioned, that the relative number of the several classes of farm toilers was as follows: For every 1,000 farm owners and tenants and males, 15 years old, other than owners and tenants, employed in agricultural labor, there were about 376 farm owners, at least 28 farm tenants, 373 wage-earners or children of farm parents, and 223 slaves—a total of wage-earners, slaves, and children, of at least 624.

In 1880, the males over fifteen years of age employed at agricultural labor numbered 6,538,198, and the number of separate farms was 4,008,907. Of these farms, 2,984,306 were operated by their owners, and 1,024,601 by their tenants. Of such owners and tenants, about 250,000 were women. On all the farms at least 2,780,000 males over fifteen years of age worked for wages or for their parents. For every 1,000 farm owners, tenants, and male workers other than owners and tenants over fifteen years old, there were 439 farm owners, 151 farm tenants, and 410 men and boys working for wages or for their parents.

In 1900, the males 15 years old toiling on farms numbered 8,549,739. The number of separate farms was 5,737,372; the farms tilled in part or wholly by their owners numbered 3,712,408; and those tilled wholly by tenants was 2,024,964. Of these farms 362,295 were conducted by women. The males over fifteen years of age working for wages or employed by their farm parent numbered at least 3,174,662. For every 1,000 farm owners and tenants and male workers other than owners or tenants over fifteen years old, there were 417 farm owners, 227 farm tenants, and 356 others, of whom substantially one-half worked for wages and the remainder for their parents.

The relative number of farm owners was greater in 1900 than in 1850, although smaller than in 1880, there being apparently a tendency to return to the earlier proportion. The relative number of tenants was many times greater in the latter than in the earlier year, and had shown a tendency to uninterrupted increase, while that of the lowest order of farm labor had shown a most marked tendency to decrease in relative importance. Its proportion of all farm labor was only 59.6 per cent as great in 1900 as fifty years before, and the relative number in the latter year, working for wages was only two-thirds as great as that of the slaves fifty years before, and constituted a smaller per cent of agricultural labor than it did in 1850. The wage-earning class in 1900 constituted only one-sixth of the toilers on American farms, and no discussion of agricultural labor can be of any significance which consists of a discussion of the wage-earners and their wages.

The foregoing treatment of the subject has disregarded the fact that many negro farm tenants, especially in the South, are in reality wage-earners under another name, and represent a new phase of labor organization on the farm. In 1900, these tenants numbered 560,640, or less than the negro male slaves over sixteen years old in 1850; hence, after making all necessary allowance for the present inferior status of even a majority of these negro tenants, the facts warrant the statement that the negro tenancy, like other farm tenancy in the United States, is part of an upward rather than a downward movement of agricultural labor.

The census of 1900 disclosed the fact that of the toilers on farms, other than owners and tenants, at least one-half were the children of such owners or tenants. It does not throw any direct light on the number of tenants who are the children or other relatives of the owners, and are thus on the direct road to ownership. The census does, however, provide indirectly the most positive evidence that there is a movement among the toilers on the farms by which the children of farm owners succeed their parents as owners by inheritance or by purchase after an apprenticeship as employes or tenants. It also furnishes evidence of the existence of an upward drift among those of foreign birth who begin work on American farms as wage-earners.

The information relating indirectly to this subject is of two distinct classes, (1) that giving the age and sex of the agricultural workers, and (2) that stating the age and sex of the persons who as owners or tenants are the heads of farm homes, i. e., the homes of those in direct charge of farms. Of those called "farm families" by the census, i. e., the families of farm owners and tenants, there was in 1900 an aggregate of 5,649,011, of whom the head was farm owner in 3,638,406 cases and tenant in 2,010,605. Of the same families, the head or chief member was a man in 5,286,816 cases and a woman in 362,195. Of the last number, the greater proportion undoubtedly were advanced in years, that is, persons who had become farm owners or tenants by the death of husband or parent.

The relative status of the farm workers of the earlier age periods is undoubtedly best ascertained by comparing the number of heads of farm families—owners and tenants—with the number of male agricultural toilers. Such status is best shown in the later years by a comparison of the heads of farm families with the total number of males and females engaged in agricultural pursuits. The following table presents in parallel columns for 1900 the number of both sexes and those of males engaged in agricultural pursuits, the number of farm families whose heads or principal members were farm owners and the number of such families whose heads were farm tenants:

Age period	Number employed in agricultural pursuits		Number of farm families	
	Total	Males	Owners	Tenants
Total	10,381,765	9,404,429	3,638,406	2,010,605
Under 25 years	3,592,654	3,123,671	76,419	198,679
25 to 34 years	2,055,296	1,931,619	541,064	653,418
35 to 44 years	1,709,214	1,595,062	908,252	501,579
45 to 54 years	1,434,111	1,317,269	916,376	379,772
55 to 64 years	933,117	843,963	683,475	181,294
65 years and over	630,965	569,915	506,453	89,969
Unknown	26,408	17,269	7,367	5,894

In order to reduce the figures of the foregoing table to a common basis, there is computed and shown in the table that follows, for each age period, the number of farm owners, farm tenants, and other farm toilers per 1,000 of the total number of that age period employed in agricultural pursuits:

Age period	Numbers belonging to specified classes per 1,000 agricultural workers of specified ages		
	Owners	Tenants	Other workers
Total	351	193	456
Under 25 years	21	55	924
25 to 34 years	263	318	419
35 to 44 years	531	293	176
45 to 54 years	639	265	90
55 to 64 years	732	194	74
65 years and over	801	143	56

The figures of the last table present, for the later age periods, a fairly correct exhibit of the proportionate numbers of the three classes of farm toilers in the United States. For the earlier age periods they exaggerate to a slight degree the proportionate numbers of the male workers other than owners and tenants, and understate those of the two classes last mentioned.

The extent of this over-statement can be seen if, as a basis for the computation, the number of male workers is used instead of the total number of those employed in agricultural pursuits. This would give 24 and 280 as the proportionate numbers of farm owners in the first two age periods, instead of 21 and 263 as shown in the table. The true proportionate numbers for the earlier years are somewhere between those obtained by the two methods. Keeping in mind the margin of error included in the table, and the character of such errors, the figures make clear the following general facts:

The relative number of farm owners among the men and women under 25 years is very small. It does not exceed 24, and may not be greatly over 21 per 1,000 of those engaged in tilling the soil. The men and women who own the farms they till form a larger proportion of the agricultural toilers of the more advanced ages. This proportion is greatest for those of the last age period, in which they number 801 in every 1,000,—a proportion materially greater than could have existed in 1850 or in any earlier year of American history.

The number of farm tenants among 1,000 males or females under 25 years, engaged in agriculture, for the reasons stated at length in the case of farm owners, was not greater than 63, and could not have been less than 55. In the age period from 25 to 34, the proportionate number was greater than for any other. It was at least 318, but could not have exceeded 338. The proportionate number of these tenants decreased at each period after the age of 35 until, in the period succeeding 65 years, the tenants did not exceed 143 in 1,000 farm workers.

Of toilers under 25 years of age, the greater number were employed for wages or were assisting their parents on owned or leased farms. These workers constituted at least 913, and possibly 924, in 1,000 male and female workers of the age specified. The number proportionately decreased until, in the period of those over 65, the wage-earners numbered only 56 in 1,000 farm toilers.

These figures, with all their defects and imperfections, make clear the fact that practically all the toilers on farms in the United States enter upon agricultural labor either as wage-earners or as the helpers of their parents. With the passage of years, 80.1 per cent of them become owners either directly from their earlier status or indirectly through farm tenancy. Of those who do not at last attain to the status of farm owner, 14.3 per cent close their career as tenant farmers, and 5.6 per cent as wage-earners. Further, all available information relating to the subject makes it probable that the greater proportion of those who end their farm labor as tenants or wage-earners are of negro descent.

Of the persons, male and female, on American farms employed in agricultural pursuits, there were in 1900, 1,074,211 foreign-born whites and 1,100,608 native whites of foreign parentage, making a total of 2,174,829 of foreign parentage. Of this number, 1,019,359 were operating farms as owners, 299,774 as tenants, and 7,953 operated farms, but the form of their tenure was not ascertained. The large relative number of owners calls attention to the advantage American farms afford for the immigrant farm laborer to rise above his earlier status and become the operator, and at last the owner, of a farm.

Agriculture in the United States may be said to have passed through a number of distinct phases. In the first, the farmer felled the forests, cleared the fields, and prepared them for cultivation. In that phase or stage of the industry, agricultural labor called more for the exercise of brawn than of brain; the labor produced but little more than was consumed by the farm population while engaged in opening up new lands for cultivation.

This phase was followed by one of increased production with but few improvements in the implements or methods employed. This period covered the years 1800 to 1850. It was a time when the farmers began to reap a return for their pioneer labor. The labor required for opening the fields being reduced, the average productivity was increased at least 50 per cent. This was the era in American agriculture of the hired man and of the slave, whose ranks included over 50 per cent of those in the industry.

The succeeding period, which extended from 1850 to 1900, was one of industrial, social, and economic changes that were nothing less than revolutionary in their character. By the introduction of improved machinery and the extensive use of horses, the productivity of human labor was greatly increased. The overthrow of the institution of slavery and the opening up of vast tracts of fertile land in the West changed an army of slaves and wage-earners into men of a higher social and industrial order. The total number of wage-earners and slaves for this period reached a smaller relative proportion than was ever before attained in this or any other country, and the relative numbers of owners and tenants were correspondingly increased.

Scientific agriculture and its effect on farm labor.

With the beginning of the twentieth century, the nation is entering upon a period of scientific agriculture. With but few new fields to open to cultivation, it can support its ever-increasing millions only by securing a greater average productivity of the soil. To obtain this result, agricultural labor must be directed by a higher order of intelligence, and apply all the scientific discoveries that have been made in the past or may be made in the future. The application of these discoveries will affect the organization of agricultural labor as much, if not more, than was witnessed in the last half century.

If rural schools can be organized in such a way as to impart the added knowledge of scientific agriculture to the average boy and girl upon the farm, the next half century will see a continuance of the movement recorded in the last half. Farm labor will become more and more independent and self-directed, and the only large amount of agricultural labor other than that of the farm owner or tenant will be that of his children who are being trained in the art and science of agriculture.

If, however, the schools cannot be organized to teach this science and art to the average agricultural worker in such a way that he may be able to apply them successfully, the country will see a return to the customs and organizations of an early date; a few men in charge of large farms, and possessing a mastery of the science and art of agriculture, will direct the labor of an army of wage employees of a lower grade of intelligence and skill. Agricultural labor of the future must be directed by a greater intelligence and knowledge, and time alone can determine whether that knowledge and intelligence shall be the portion of the many, or only of the few. It is to be hoped that later census investigations will secure the data on which can be based a correct judgment concerning the present drift upon the farm with respect to this subject.

The United States census of agriculture reported that, in 1899, the farmers of the United States paid as wages for hired help a total of $357,391,940. The number of males and females employed in agricultural pursuits, in excess of the number of farms, was 4,644,393, of whom 2,535,366 were reported members of the farm families, and not far from 150,000 were wage-earners whose wages would not be included in the census of farms. The number of wage-earners whose compensation is included in the census report above given cannot have been very far from 2,000,000. Their average compensation—men, women, and children—was, therefore, $182 per annum. This average may well be compared with that of the annual earnings of all engaged in agriculture, as the same is stated in "Agriculture Compared with other Industries" (page 11). That average was $226. Farmers and farm laborers, in both instances, as a rule, received their board in addition to the money compensation here stated. [For a statement of the total and average earnings of laborers in agriculture and in other industries, see the article on page 4.]

RELATIONS OF FARMER AND FACTORY WORKER

By *Charles Lepley Hays*

From early times, both the farm and the factory populations of the United States have been recruited from all the races and all the vocations of Europe. There is no great difference in their racial origin. In the Old-World sense of the word, there is no farm peasantry in this country. The ease with which individuals from either class enter the occupations of the other is due to the resourcefulness that is even yet subduing a new continent. The differences in the environments of the two classes have modified but not destroyed the unity of their ideals and modes of thought. Their economic and political interests are essentially similar. The growing complexity of American life gives value to all rational discussion of their mutual relations.

The census of 1900 shows the farm population to be the largest, and the factory population as next in importance. The table following shows those above ten years old engaged in gainful pursuits:

	Per cent	
Agriculture	37.7	10,438,219
Professional	4.3	1,264,739
Domestic and personal	19.4	5,691,746
Trade and transportation	16.3	4,778,233
Manufacturing and mechanical	24.3	7,112,987

These two classes are, in the strictest sense, the producers of the national wealth, though, in the broad and accurate sense, all who contribute valuable services are producers. Transportation and merchandising and most other forms of industry may be said to be auxiliary and subsidiary to farming and manufacturing, being the means of distribution of the things produced by farmers and factory workers.

Farmers and factory workers as classes.

The great body of the common people are within the ranks of the farmers and factory workers, and these are the bone and sinew of the nation. Their welfare is the national welfare and their problems are the nation's problems. They have an equal and profound interest in sound institutions and good government. An examination into their racial, social, political and economic community of interests will reveal no reason why they should ever be arrayed against one another as classes, but, on the contrary, many reasons why every means toward mutual understanding and practical coöperation should be employed by both.

There are some contrasts in the conditions under which they live. The farmer lives in comparative isolation. His work is mainly self-directed and individualistic. He deals with the forces of nature at first hand in the open air and produces, in the main, the raw materials of commerce. Factory workers are massed into groups, companies and armies of highly organized and disciplined mechanics, each with his more or less minute specialty. During every working-hour he is under the personal direction of another. He becomes a part of a great industrial machine into which his own individuality must largely be sunk.

In another aspect, the farmer is a capitalist of conservative tendencies, living an independent existence, whose isolation hinders coöperation in any widespread movement. The great hives of factory workers, constantly recruited from the discontented workers of Europe, tend to become camps of radicalism. Their surroundings train them to effective organization in unions for their own economic and political protection.

The two classes as producers.

The two classes produce for the world's markets and for each other. The wheat of the Northwest, the beef and butter, the hides and wool of the West and Southwest, the fruits of the South, the North and the Pacific West, are exchanged for the fabrics, the clothing, shoes, tools and machines of the East and the North. The farmer no longer garners his meager crops with tools made in the little blacksmith shop, and his wife no longer spins and weaves the family homespun. Interdependence and exchange unite both classes. In four generations, farming has spread from the Alleghanies to the Pacific, and the producing power of every farmer has perhaps quadrupled. Since colonial times, when the repressive policies of the British government prevented the extension of manufacturing, factory growth has been equally rapid in improvement, in methods and in the variety and extent of the output.

It was natural that factories should first grow up along the Atlantic coast, nearest the foreign markets and the largest centers of population, and it is perhaps natural that the eastern factory interests should continue to lead. The census shows that the center of factory production moved westward, until it is now near the center of the state of Ohio. The center of agricultural production, however, has moved beyond the Mississippi river, and is now approaching the Iowa-Missouri line, some five hundred miles in advance of factory production.

The causes for the slow westward march of manufactures are partly natural and partly the result of artificial conditions. Chief among the artificial causes are transportation rates. The large cities have always contributed most largely to the capital of the railway systems of the country, and have always had the controlling voice in their management. It was incidental to the development of our railways that the great cities should thus obtain important advantages in freight and passenger rates. They possess these advantages to this day, notwithstanding some national and state legislation tending to correct some of the grosser inequalities.

Shippers in the great cities, it is believed, have been able to secure a large part of their shipments at rates barely equal to the cost of operating the trains. Such shipments have paid nothing toward the cost of maintaining the roadbed and equipment, the expenses of railway administration, interest on bonds or dividends on stock, thus leaving these charges to fall with double severity on shipping points less favored. Railway managers attempt to justify shipments at these low rates as being in competition with transportation by water and with rival lines. Transportation expenses comprise a very large and controlling element in the cost of many manufactured products.

Factory workers in large cities.

Factories have been forced by these discriminations into the large cities. Factory workers, with their families, are forced to live where the factories locate; thus, railway rates have become an important factor in the tremendous recent growth of the great cities, and in the retarded development of manufacturing in many regions in the East, and over immense areas in the West and South that are still purely agricultural.

No more threatening racial problem has arisen than the congestion of the working populations of the great cities. There are said to be more than a million people in New York City alone living in slum conditions, and it is said that in one city block are huddled and crowded more than six thousand human beings. Every great city presents a similar problem, with its inevitable train of misery, vice and personal degeneration. Wages in a great city are so low and expenses so high that the ownership of a home is beyond the reach of most workingmen. It has passed beyond the power of the city workingman to own or to rent a home suitable for the rearing of children and the housing of the mothers who care for them. Even the respectable flats cannot afford the room, fresh air, sunshine, play room, contact with nature and freedom demanded for the development of growing children. The cities were never growing so fast as now, and, despite the efforts of the philanthropic to alleviate their conditions, the lot of the city workingman and his family threatens to become increasingly crowded, unwholesome and unhappy.

The farmer and the concentration of manufacturing in large cities.

The farmer, too, suffers from the concentration of workers into the cities. In regions devoted exclusively to agriculture the isolation of the farm is the most complete. There is wanting that variety of occupations for farm youth which their diversity of talents demands, and many look to the city as the escape from the monotony of their existence.

The products of the farm must pay the charge of a long haul to the distant market, and the distant factory product must pay the charge of the long haul to the farm. Local freight rates are excessive. All transportation charges thus become a heavy burden. The long haul is prohibitive of many articles, which become waste by-products of the farm. Regions remote from markets are given mostly to grains and live-stock. Farm values remain depressed. It is idle to talk of intensive farming in regions that lack markets for all the varied products of the soil, and where farm values remain low. It is certain that the West and South have suffered a retarded manufacturing growth because of the cheap long haul to the large cities and the excessive local rates. It may be that the key to the decline of agriculture in parts of New England is the concentration of manufacturing in the great cities and high local rates to a degree not always appreciated.

It needs no demonstration to show that there is great economic advantage, both to the farmer and the factory worker, to bring them close together, when the factory works up the product of the nearby farm, when the farm furnishes the ultimate market for the factory product, and when the farm feeds and clothes the factory worker, as under these circumstances the long haul is eliminated. Even when the factory product is sold in a distant market, cheap sites for the factory and the workers' homes, wholesome surroundings, cheap food, fuel and clothing would turn the scale against the city as a manufacturing site in many lines of business, if transportation rates and facilities, which would give the village site an equal chance, were assured.

The South has long shipped its cotton to New England, and paid the freight both ways on the finished fabrics sent back to it, and is but recently beginning to utilize its own advantages in raw materials, cheap labor, water-power and mild climate. The manufacture of southern cotton in New England is at once an instance of the retarding influence of the cheap long haul and excessive local rates, and of the fact that other influences, wholly outside transportation rates, usually enter into the problem. The West and South ship hides, wool, cotton, live-stock, grains, fruits, lumber and other products to the North and East, and receive back shoes, cured meats, cotton and woollen fabrics, and many other articles made from their raw materials, paying the cost of transportation both ways, when the goods might be manufactured at home. The economic loss is national. It may be questioned whether even the railroad companies, which by this means enjoy the double long haul, would not prosper even more if industries were encouraged to spring up along their lines, because the long haul is made at cheap rates, while the local haul can at all times be placed on a lucrative basis. The shippers of the West and South ask for the cheap long haul to get their products to the eastern markets, and yet it is this very long haul that stands in the way of cheap local rates and local manufacturing.

There will be sharp difference of opinion as to whether the better policy will be to await the present unmistakable progression toward level transportation rates over the region east of the Rocky mountains, or whether it should be hastened by the fixing of rates by direct act of the Government. It is evident that, in the present state of the railway business, the railway ratemakers, no matter how fair-minded, cannot of their own initiative greatly hasten level rates, and farmers and factory workers suffer by the delay.

The modern mergers of railroad companies, manufacturing concerns, public utility companies, banks and insurance companies into great corporate bodies, are the work of the great money centers. Small groups of financiers are rapidly syndicating these corporations into financial units, and it is conceivable that for many purposes these interests may yet pass under the practical control of a single mind. It is believed by many, in all political parties, that the American system of high tariff walls encourages the formation of great manufacturing trusts, and so far as this is true, the system contributes to the concentration and congestion in the cities of the very workingmen whose welfare the tariff was devised to protect. The capitalists who compose the modern syndicates are interested in the real estate, banking and other enterprises of their own cities, and want railroad rates that will aid their investments. The tendency city-ward will continue until transportation rates and facilities place the farms and villages upon an assured equality with the congested centers.

Outlook.

Together, the American farmer and factory worker should create new possibilities in American life. Let the factory be located again, as in the early days, next to the farm, the source of raw materials; but let both the farm and the village offer what is best in modern civilized life, without the discomforts, dangers and degeneracy of crowded city existence. Since the farm and the village are immovable, the factory and the worker must seek them where they are.

TAXATION OF FARM VALUES

By *M. B. Hammond*

The place occupied by farm values in the system of state and local taxation in the United States and Canada is one of commanding importance. Not only is this so because agriculture has been and still is the main occupation of the people of the United States, but also because the working of the machinery for levying and assessing taxes has been such in all the states and provinces as to throw a disproportionately large share of the burden of raising revenue on the farming classes. That this was not the intention of the laws scarcely needs proof, when it is remembered that in the majority of the states the representatives of the people are elected mainly by the farmer vote.

History of the present system of taxation.

Our system of taxation based on property valuation is the direct outcome of the feudal system of medieval times. Under the feudal régime the duty of all classes to contribute to the support of government was in direct proportion to the amount of land held in fee simple. With the rise of cities and the growth in importance of the industrial and commercial classes, the amount of land held by an individual no longer afforded a satisfactory test, in all instances, of his ability and duty to contribute to the support of government. Taxation, therefore, was extended to other forms of property and, as the value rather than the mere extent of property seemed to offer a better test of tax ability, it gradually displaced the older standard.

The idea that every individual is bound to contribute to the support of government in proportion to the value of the property held by him, no matter of what sort it is, had found general acceptance in England by the time the American colonies were being established. In those colonies first established by English-speaking people, the English system of taxation was introduced in much the same form as that with which the colonists had been familiar in the mother country. Poll-taxes and property taxes, intended to reach all classes in the colony, were the principal sources of revenue.

The relative emphasis placed on these two forms of taxation was, however, different in the various colonies. In New England, where nearly every one held land and where the spirit of democracy in government was strong, the property taxes were from the very first the most important source of revenue. In Virginia and the other southern colonies, however, the influence of the aristocratic planter class was strong enough to prevent for many years the raising of any considerable revenue by means of a land-tax. So the poll-tax and certain indirect taxes on imports and exports were the principal fiscal resources of the colonial governments in the South.

In New York, during the Dutch period, the great bulk of the colonial revenues were derived from customs and excise duties. As these proved burdensome to many of the people, and brought in insufficient revenue, they were supplemented in 1655 by a tax on real property, including houses or lots and milch cows and draft oxen. Increasing emphasis was placed on the property taxes when the colony passed under English rule and, by the end of the seventeenth century, the system of property taxes had spread throughout the colony.

In Pennsylvania, the first comprehensive tax law, that of 1684, provided that one-half of the revenues should be collected by means of land-taxes and the balance by means of a poll-tax on males between sixteen and sixty. In New Jersey, the first taxes were land-taxes, and not until 1682 were efforts made to tax personal property.

In spite of the different origins of the colonial tax systems and the differences in the social and economic environment of the people of the various colonies, the tendency throughout the colonial period was for these tax systems to approach each other in form and character, so that by the end of the eighteenth century, outside of the southern states at least, the general property tax may be said to have been universal.

Much the same course of development took place in the new states which, after 1789, were formed out of the public domain, one by one. Land was usually the first thing taxed, oftentimes being divided into various classes and a different tax rate being assessed on each class. Thus, in Ohio until 1826, lands were divided into three classes and a different rate was assessed on each class. These land-taxes were supplemented by the selection of certain specified articles for purposes of taxation; horses in Ohio under the act of 1803 being taxed thirty cents each, and neat cattle twelve and one-half cents each. By gradually adding to the list of specified articles, one form of property after another was made subject to taxation, until finally the process was made complete by the enactment of a general property tax law in 1846. In Ontario, the general property tax in its present form dates from 1866.

Theory and faults of the general property tax.

The theory of the general property tax that is now the main source of revenue for the local governments in all our states and provinces and for many of the state governments as well, is that every one is bound to contribute to the support of the state in proportion to the value of the property possessed by him. Property is construed to mean not only real estate and tangible personal possessions such as live-stock, tools, machinery, stocks of merchandise, and the like, but also money, credits, certificates of ownership in joint stock companies, and securities of all sorts.

Even from the standpoint of theory, the general property tax is open to serious criticism from two points of view. It is obvious that a man's ability to contribute to the support of government is determined to a less extent by his property than by his income, this latter being the fund from which all his expenditures are met. There are many persons in every well-developed community who receive incomes from personal services as do lawyers, physicians, teachers, skilled and unskilled laborers, who oftentimes possess little or no property and are therefore not subject in any considerable degree to taxation. In the Canadian province of Ontario some recognition of this fact is seen in the effort to tax personal incomes at the same rate as property is taxed, but this failure to distinguish between the two concepts of property and income shows that no adequate solution of the difficulty has been reached.

Even among property owners themselves, the value of the property is by no means a true indication of its owner's ability to pay taxes. The dentist with his operating instruments and office furniture valued at $1,000 may be in receipt of as large an income from the use of his property as the merchant who has a stock of goods valued at $20,000, but which will yield him a very small profit. Yet according to the theory of the property tax, the merchant would pay a tax twenty times as much as that assessed to the dentist.

Another theoretical objection to the general property tax is that it calls for double taxation. Since not only property itself is subject to taxation but evidences of indebtedness resting on the property are also taxable in the names of their owners, it is evident that the income-bearing property is thus made to bear a double burden of taxation. It is true that in many states efforts are made to meet these objections by a system of exemptions, reduced valuations, and the like. These efforts, however, only partially remedy the evil and, to the extent to which they succeed, they destroy the theoretical simplicity of the general property tax.

Administrative faults of the general property tax.

More important for our present purpose than these theoretical objections are the administrative objections to the general property tax. It is the defects in its administration that cause the general property tax to burden unduly the farming class. This faulty administration is not due, in the main, to the character of the officials but is inherent in the very nature of the general property tax. The evils of the tax are to be found in the mode of assessment. Although differing much in detail, the mode of assessing property taxes is much the same in all our states and in the Canadian provinces as well.

Everywhere the original assessments are made by local officials elected by the people of the community in which they reside. In most cases, the assessments are subject to revision by a local board of review or equalization that has power to change the assessments made by the local assessor on complaint of any one who considers himself to have been unfairly taxed.

In those parts of the country having the county system, the board also attempts to equalize the rate of assessment between the townships or other tax districts. In many instances, these boards of review are composed of the assessors themselves acting collectively. In any case, the members of the board have no first-hand knowledge of the true valuation of property assessed and must rely to a great extent on the facts supplied by the assessors themselves. Except in cases where it is easy to prove that gross injustice has resulted from the assessment, the work of the local assessor must, therefore, needs be accepted. As far as equalization between the townships or taxing districts is concerned, equalization in practice consists merely in attempting to reduce the assessments in those districts having the higher to those having the lower rating. This is done to mollify the complaints of those residing in the districts that have been given a higher rating.

In making the original assessment, the assessor is bound to be governed, in the main, by the statement of the party to be assessed as to the property he holds. In every state and territory of the United States except New York, the taxpayer is required, or may be required, to furnish a list of all his property subject to assessment and to make an oath or affirmation as to the correctness of the list. In about one-half of these states, this oath covers the value as well as the amount of the property taxed; in the remaining states, the taxpayer swears only as to the amount but not as to the value. In spite of this oath, the assessor or the board of review is generally allowed to revise the list made by the taxpayer. In Canada, although the tax laws assume the existence of a general property tax, the exemptions of personal property, either expressed or implied, are so numerous that in practice the tax is little more than a tax on real estate.

The evils that result from the mode of assessment just described are threefold: (1) Personal property, to a great extent, escapes assessment altogether and when discovered is generally undervalued as compared to real estate. (2) Gross inequalities exist in the assessment of different individuals within the same tax district. This is sometimes the case with real estate assessments but holds true especially of personal property. (3) Gross inequalities exist between the assessment of both real and personal property in the different tax districts.

It will be the chief purpose of this article to explain these defects in the taxing system that have been listed and to show how they affect farmers unfavorably as a class.

First defect of the present system.

In farming communities, the great bulk of the property subject to taxation consists of land, buildings and such forms of personal property as live-stock, farm implements, and household goods which can not be hid from the view of the assessor and whose values are more easily ascertained than those of the property held by residents of the cities. Even in the case of the intangible property, it is doubtless true that this is more easily discovered in the country than in the city.

Except in some of the eastern states, farmers as a class are not the possessors of any considerable amount of the stocks and bonds issued by our various corporations or the securities issued by the various grades of governments. The prosperous farmers in every community usually have some mortgage investments, but these usually rest on the land of their neighbors and are likely to be a matter of general knowledge in that community. A careful and diligent assessor is not likely to have much difficulty in securing their return for purposes of taxation.

In the cities, on the other hand, individual incomes result from the prosecution of some business enterprise, professional calling, or from the loan of accumulated capital. The theory of the general property tax, when strictly applied, is that every individual is bound to pay according to the extent of his ownership in the property employed in each of his businesses or according to the value of his loanable investments. The local assessor, however, has no means of knowing the extent of the individual's holdings other than the statement of the individual himself. In all but a very small percentage of cases, therefore, the assessment of this personal property is self-assessment, and a strong incentive is offered to the taxpayer to under-value his property or to conceal it altogether.

Since the expenditures of our municipalities are very large as compared to those of the farming communities, the tax rate is high,—often from 3 to 7 per cent of the value of the property. Even the citizen who is inclined to be honest and desires to pay his full share of the taxes finds that if he were to return all his property at its cash value as called for by the tax laws, he would be compelled to surrender to the government from 40 to 100 per cent of his entire income, merely because his neighbors are not making full returns. Under such circumstances, therefore, the honest citizen is likely to value his property for purposes of taxation at about what he believes to be the average assessment value of his community. It is needless to say that the less honest citizen makes much lower returns. Hence, the false returns made by all classes differ only in motive and degree. The false returns made by all keep the tax rate high and the high tax rate leads to more strenuous efforts to escape its burdens. It would be hard to find a more striking example of the evil results that flow from a faulty system of assessment.

Recognition of the fact that self-assessment in the case of personal property results in the escape or undervaluation of the great bulk of it has caused assessors nearly everywhere to accept less than the law requires in the case of real-estate valuations in both city and country, hoping thus to equalize the burden. Thus, the United States Census Bureau reports the average tax rate on all property in the United States in 1902 as $2.05 on the $100 of assessed valuation, while the same authorities estimate that this rate should be only 74 cents on the true valuation of such property.

An extreme example of the extent to which undervaluation is resorted to is shown in the state of Nebraska. The law requires that property be returned for purposes of assessments at its fair cash value. In 1902, the census estimate of the true value of property in that state was, in round numbers, $1,818,000,000. Its assessed value was, however, but $181,000,000, or one-tenth of what may be assumed to be the true valuation. The result was that the average tax rate for the state that year was 5.27 per cent of the assessed valuation, but only .52 of 1 per cent of the estimated true value. Real estate in Nebraska, it may be said, in passing, was assessed at $116,000,000, and personal property at $34,000,000. In a state, the industrial character of which is so largely agricultural, this difference might not be so surprising were it not for the fact that in the city of Omaha, real estate and improvements were assessed at $14,400,000 and personalty at only $4,360,000.

Unfortunately, there are no statistics available that show for the country as a whole the extent to which farm values contribute to the support of the state and local governments as compared to the amounts assessed on other classes of property. The United States Census Bureau has, however, conducted an investigation that affords us a means of determining the extent to which both real and tangible personal property are undervalued for purposes of taxation in this country. Inasmuch as the great bulk of farm values consist of real property and its improvements, these figures show to a certain extent the burden placed on farming by unequal taxation.

According to the census investigation, the estimated true value of all property in continental United States in 1904, was $107,104,192,410. Of this amount, real property and improvements were estimated to have a true value of $62,341,472,627, or 59.4 per cent of the total. The total assessed valuation of all property subject to the *ad valorem* taxation was $38,963,381,120, or 36.4 per cent of its estimated true value. Real property and improvements, however, were assessed at $30,089,818,672, or 48.1 per cent of their estimated true value, whereas all personal property, tangible and intangible, was assessed at only $8,873,562,448, or 19.8 per cent of the estimated true value of the tangible personalty alone. Under tangible personalty, the census authorities included (1) live-stock; (2) farm implements and machinery; (3) manufacturing machinery, tools, and implements; (4) gold and silver coin and bullion; (5) railroads and their equipment; (6) street railways, shipping, waterworks, and the like, and (7) all other forms, chiefly the products of agricultural, mining and manufacturing industries, clothing, carriages and kindred property.

The census authorities in their estimate of the true value of personal property, it will be noted, did not include the intangible property, since this is only representative of values. Since, however, the tax laws of most of the states provide for the return of the greater part of this intangible property for purposes of taxation, the figures giving the assessed valuation of personal property include not only the returns for the above mentioned tangible property, but also as much of the intangible as the assessors had been able to discover.

It is certain that not more than from 5 to 10 per cent of the intangible property is actually listed for purposes of taxation. In using, therefore, the figures just given to show that real property throughout the country is assessed at 48.1 per cent of its true value, while personalty is assessed at 19.8 per cent of its true value, it must be remembered that intangible property,—mortgages, bonds, stocks, notes, moneys on deposit, and the like,—are not included in the estimated true value of personal property. Hence, the full extent to which personal property is favored for purposes of taxation cannot be shown.

Although in all the states and territories the undervaluation of personal property for purposes of taxation is much greater than in the case of real property, the degree of preference shown by the various states varies greatly. In the leading industrial states in the eastern part of the country the undervaluation of personal property is the greatest. This is partly because the great bulk of the personal property consists of intangible personalty, such as securities, money on deposit, mortgages and other credit instruments that cannot easily be found, and partly because in these states the tendency is strong, even when the laws do not directly provide for it, to relieve certain kinds of personal property from direct taxation and to tax them through the business organization they represent or the property by which they are secured. It is also to be remembered that in these states the commercial and industrial classes are most numerous and influential and their influence is generally thrown against the efforts to enforce the tax laws in so far as they affect personalty.

If we take certain states, however, that contain no large cities and whose industrial activities are therefore known to be mainly agricultural, we shall find that the tendency to favor personal property in the tax assessments is almost as strong as it is throughout the country as a whole. Thus in 1904 in Indiana, real property constituted 57.6 per cent of the total property assessed but paid 63.7 per cent of the taxes. In Iowa, it formed 60.9 per cent of the total and paid 72.9 per cent of the taxes. In Kansas, the percentages were 50.7 and 66 respectively; in Mississippi, 45.8 and 60.9; in Nebraska, 53.8 and 64.7; in North Carolina, 49.7 and 64.4; in North Dakota, 51.5 and 63.2; in South Dakota, 57.1 and 69.6; and in Vermont, 55.8 and 74.7. On the face of the returns, conditions would seem to be even worse in the Canadian provinces. In 1899, real estate constituted 95.2 per cent of the total assessed valuation in Ontario. It must be remembered, however, that the great mass of personal property is there exempt from taxation

These figures, which show the tendency to throw the burden of the general property tax upon the real estate in the agricultural states, indicate clearly that the failure of the general property tax to reach personal property is inherent in the system and is not due to the unwillingness of tax officials to place personal property on the tax lists. These officials in the states just mentioned are, of course, responsible in the main to a farming constituency whose interests are strongly in favor of a lessening of the tax burden on real property.

It should be said in all fairness, however, that holders of intangible property do not escape taxation to the full extent indicated by the above figures. With the growth of the modern corporation as a method of business organization, the greater part of the property and wealth of such business enterprises is represented by certificates of ownership (stocks) or of indebtedness (bonds) in the hands of individual investors. In partial recognition of the fact that it is difficult, indeed well nigh impossible, to discover these certificates of ownership or indebtedness in the hands of their owners, and that it would be difficult to determine their value if they were found, most states have endeavored to reach this wealth through the corporation itself and have introduced corporation taxes of one form or another as a supplement to the general property tax. Sometimes, when this is done, the stocks and bonds of domestic corporations are exempt from taxation in the hands of their owners. Whenever this is not done, there is of course theoretically double taxation. So little of the intangible property of this nature is actually discovered, however, and so seldom does it happen that the property of corporations is taxed at as high a rate as ordinary property, that in practice, even when double taxation takes place, it is not often that personal property pays its full share of the tax burdens.

Besides the property taxes, there exists in some states a system of business taxes assessed on ordinary business occupations and professional callings and in many instances poll-taxes, liquor licenses, numerous fees, fines and forfeitures which, taken in the aggregate, reduce considerably the burden of taxation falling directly on the real property. The share of the total revenues of the state and local governments raised in this manner varies considerably in the different states. In 1902 in continental United States as a whole, 75.6 per cent of the total revenues of the state and local revenues, including those of the incorporated municipalities, were raised by means of the general property tax. In North Dakota, this percentage ran as high as 89.1 per cent and, in Kansas, 88.4 per cent.

Taking the twelve great agricultural states which together form the North Central division of the United States, we find the average percentage of revenues raised by the general property tax to be 80.6. On the other hand, in the District of Columbia the general property tax is relied on for only 38.7 per cent of the revenue, in Connecticut for 59 per cent, in Florida, 59.8 per cent and in Alabama, 60.1 per cent. Generally speaking, in the southern states the general property tax yields a smaller percentage of the total revenue than in the North, because of the larger use made of the business and professional taxes in those states.

This most serious defect in the general property tax, viz., the fact that it cannot be so administered as to make all forms of property contribute their proportionate share of the tax burdens, is not a matter of recent discovery, although the defect has become more noticeable with the passing of time and the greater proportion of the wealth of the country that is held in the form of personal property.

The escape of personal property was indeed noticed almost from the time of the introduction of the general property tax. This tax was first levied in this country by an act of the Massachusetts General Court dated September 28, 1630. Only twenty-one years later, in spite of the fact that the residents of that colony were supposed to possess Puritan consciences, the General Court, in seeking to amend the law, says that it has been "found by experience that visible estates in lands, corn, cattle, are according to rule fairly taxed," but that the estates of merchants escape taxation in large part.

The same report comes from the New York colony after the introduction of the general property tax there. Speaking of the administration of the general property tax in New York during the eighteenth century, Professor Schwab says, "As long as taxable property was almost entirely included under the categories, land, cattle, houses, and agricultural implements, it was a matter of no great difficulty to reach it and assess it at nearly its true value. But as soon as movable property began to increase under the stimulus of trade and industry, the difficulty became greater and greater of forcing non-land owners to bear their just share of the public burdens."

Evidence of the same character becomes more frequent as we approach present times. From all the states in which any thorough investigation of the working of the tax laws has been made by a tax commission or similar body, comes the cry that under the general property tax the personal property largely escapes taxation.

Owing to the position held by New York state in the commercial and financial life of the country and the unquestionably immense concentration of personal property in New York city, the experience of that state with the personal property tax is especially significant, because, as the report of the Special Tax Commission of 1907 says:

"What is true of the city of New York is more or less true through the state; and it is true not only in the state of New York, but in every American state where the modern forms of economic and industrial life have supplanted the simpler conditions of a purely agricultural community."

In 1867, the state of New York levied a tax for all state purposes amounting to $12,647,218.71. Of this amount, real estate and improvements paid $9,439,644 or 74.61 per cent of the total, while personalty paid $3,207,754 or 25.39 per cent of the total. In 1899, the amount of the state tax for all state purposes was again practically the same as it was in 1867, being $12,640,228.09. This year, however, real estate and improvements paid $10,990,678.23 or 86.95 per cent of the total while personal property paid only $1,649.549.77 or 13.05 per cent of the total. By 1905, real estate was paying 91.13 per cent and a personalty 8.87 per cent of the total state taxes.

Within the last few years many changes have been made in the New York tax laws whereby intangible personalty of various sorts is relieved altogether from taxation or taxed at lower rates when its owners are able to show that the tangible property which gives the intangible its value is itself taxed. This is especially true of certain mortgages, and stocks and bonds in corporations liable to taxation on their capital stock. Necessary as these exemptions are, in order to avoid double taxation, the effect of permitting exemptions in some cases while insisting upon taxation of other forms of personal property has been to increase the amount of property demanding exemption when its owners have found it placed on the tax books.

During the year 1901, in New York city, in the five boroughs of Manhattan, Bronx, Brooklyn, Queens and Richmond, $3,195,997,555 of personal property was placed on the tax roll in the first instance. Before the final assessment roll had been made up, however, $2,645,804,943 of this had been cancelled on application of its owners, who claimed exemptions or unfair assessments. This left only $550,192,612 on the final assessment roll, or 17 per cent of the original assessment. In 1906, $3,455,750,122 of personal property was placed on the original assessment rolls. Of this amount, $2,928,443,182 was cancelled, leaving on the final assessment rolls only $527,306,940, or 15 per cent of the original assessment.

At the same time that these cancellations of personal property were being made on the assessment books, and were increasing from year to year, the exact opposite was happening in the case of real estate. The amount of real estate placed on the original assessment rolls in 1901, in the city of New York, was $3,033,715,602. By the time the books were closed, the amount had grown to $3,237,778,261. In 1906, $5,400,127,590 of real estate was originally listed for taxation. When the books were finally closed this had been added to until it amounted to $5,738,487,245.

Even this wide discrimination between real and personal property in the wealthiest of our cities does not tell the full story. For, while the taxes levied on real estate remain a charge against the property, and must be paid, the personal property taxes levied remain in large part uncollected. In 1901, the total personal taxes collected, exclusive of the attorney's collections, constituted only 59 per cent of the personal taxes levied. Yet this percentage steadily diminished, being in 1904 only 52 per cent of the levy, and in 1905, exclusive of attorneys' and marshals' collections, it was only 43 per cent of the levy. The amount collected by the attorney is not given, but it is stated by the commission that it never exceeded 7 per cent of the amount remitted to him for collection. The total personal taxes collected in New York city in 1901 were $7,465,741.72; by 1905 they had fallen to $4,412,116.55.

The New York State Tax Commission of 1907 sums up its investigations as to the personal property tax in that state in the following conclusions:

"(1) There has been a gradual and steady increase in the value of real and personal property in the state of New York.

(2) The greater the amount of personal property placed on the rolls, the larger the cancellation or reduction.

(3) The burden falls heaviest on the residents of our own state and principally on the smaller taxpayer.

(4) Non-residents find it easiest to escape taxation and have almost ceased to pay any tax.

(5) The collection of the personal property tax has become more and more difficult."

The findings of the California Commission show very clearly the burden placed on the farming classes as a result of the operations of the general property tax. Using the figures furnished by the United States census authorities in 1900, and that give the estimated value of farm property, with such slight modifications as were necessary to make these estimates include the same items as were included by the commission under assessed farm values, the commission concluded that in 1900 the farm lands and buildings in California were worth $726,480,653, and were assessed at $474,731,497, or about 65 per cent of their value. To this must be added the value of farm implements, machinery and live-stock, which the census estimated to be worth $88,614,995, and which the tax commission assumed to be taxed at one-half their value. The average tax rate outside the cities was, in 1900, 1.74 per cent of the assessed value, and this, according to the figures just given, would be 1.14 per cent of the true value. This would make the total taxes on farm values about $9,030,000.

The commission next shows how this assessment of farm values corresponds to the assessment on the manufacturing interests of the state. The capital invested in manufactures is given as $205,395,025; in agriculture as $796,527,955. Manufacturers were assessed at $63,500,000, or 31 per cent of their total capital value. Farmers were assessed at $474,731,497, or 65 per cent of their total capital value. This made a tax rate on manufacturers of .51 per cent, and on farmers of 1.14 per cent of the true value of their property. But the gross product of the manufacturing establishments of the state was $302,874,761 and the net product $52,172,862. The gross product of agriculture was $131,690,606 and the net product, including what the farmer and his family consumed, was $91,419,866.

The general property tax, therefore, resulted in a tax levy equal to .346 per cent on the gross product of manufactures and 6.86 per cent on the gross product of agriculture. On the net product, which is the true measure of the ability to pay taxes, the tax rate was for manufactures 2.01 per cent; for farmers 9.88 per cent.

Commenting on the above figures the commission had this to say:

"Manufacturers pay ½ of 1 per cent on their capital in taxes; farmers pay 1.14 per cent, or two and one-third times as much. Manufacturers pay ⅓ of 1 per cent of their gross income in taxes; farmers pay nearly 7 per cent or twenty times as much. Manufacturers pay 2 per cent of their net income, while farmers pay 10 per cent or five times as much. If we allow manufacturers 10 per cent on their capital as a fair return on the investment, then, on the average, manufactures should pay 2.9 per cent on gross earnings, to equal which, would only be allowing farmers a return of 4⅔ per cent on their capital. The same facts may be exhibited in another way. After allowing $2,446,238 for the average annual increase in the value of farm property and deducting 6 per cent as interest on the value of farm property, the census estimates that the 145,801 persons engaged in agriculture earned an average of $499.70 in 1899. The 113,155 persons engaged in manufacturers earned an average of $870.

"It would seem, then, that from the per capita earnings, manufacturers could afford to pay nearly 75 per cent more taxes than could the farmers. As a matter of fact, however, the farmers pay 10 per cent of their net earnings and manufacturers only 2 per cent of their net earnings. It may be that the people desire to foster manufactures by a partial exemption from taxation, but it would appear that the exemption granted goes far beyond what is probably intended.

"The persons engaged in agriculture pay, on the average, $50 per capita every year in taxes, out of an average income of about $500. The persons engaged in manufactures pay, on an average, $17.50 per capita in taxes, out of an average income of $870.

"Of the capital used in manufactures only 28 per cent is real estate, and little of the remainder is taxed."

In Canada, in the province of Ontario, some effort has been made to reduce the burdens placed on the farming classes by exempting from taxation live-stock, farming implements and vehicles, and grain, hay and other farm products, when owned by persons carrying on the general business of farming. Since the residents of the cities, however, also enjoy numerous exemptions, the net result is that nearly the entire burden of taxation falls upon the real estate.

In no state where the general property tax is in force is the tangible personalty assessed at as high a ratio of its selling value as is the real estate, and as for the intangible property very little of it is ever returned for taxation. In all states the farming population is greatly overtaxed as compared to the remainder of the community, and this must remain the case as long as the effort is made to reach all classes of property and all classes in the community by a uniform method of assessment.

The second defect of the present system.

The second great evil of the present system of taxation, we have said to be the inequalities in assessment of property belonging to different individuals within the same tax district. This defect, though less serious than the former one, is by no means inconsiderable. In most cases in which it occurs, it is not so much due to intentional favoritism on the part of the tax officials as it is to ignorance or mistaken ideas as to the way in which to value certain kinds of property. Favoritism does, of course, at times exist. The man of wealth and influence is oftentimes favored by the assessor because of that influence. Whenever this is the case, the board of review or equalization may be able to give some relief, but the most effective remedy would seem to be the political one, viz., to elect assessors free from the suspicion of favoritism or corruption.

It frequently happens, however, that the assessors err in their estimates of the value of property through ignorance of its nature and true value. The Commissioners of Taxation of the state of Washington report in 1906 that their investigations "revealed a deplorable lack of uniformity in assessed values, not only as between different counties in the state but between different classes of property in the same locality." In the assessment of most forms of intangible property such as bank deposits, notes, mortgages, etc., there is no opportunity for under-valuation, and as the law is very strict in its requirements that all property shall be assessed at its actual value, there is no discretion left to the assessor but to list it at its full value when discovered. It is the knowledge of this fact that adds to the difficulties of finding the intangible property and that makes the general property tax in the highest degree iniquitous to the conscientious few who return their intangible property in full.

With respect to the tangible property, however, there is much greater latitude for variations in assessment. In most states, the person assessed makes his own assessment, and although the assessor is allowed to add to the list of property returned, or to add to the valuation, in practice this is seldom done, or if done, is performed in the most arbitrary fashion.

Mr. Lawson Purdy has well described the difficulties in the way of assessing tangible personalty: "The labor and skill required to make a reasonably fair assessment of personal property is simply appalling; the mere enumeration of some of the items of personal property which might be owned by any prosperous citizen is a sufficient demonstration of this. The assessor might start at the taxpayer's residence, where he must value all the furniture, pictures, works of art, bric-a-brac, plate, linen, wearing apparel, books, jewelry, including of course the jewelry and wearing apparel actually being worn by members of the family.

"In order to make a fair valuation, the assessor must be an expert in valuing paintings, antique furniture, jewelry, carpets, and practically have expert knowledge of every class of articles in the house. An ordinary man could do little more than value paintings by the square foot; and one picture a foot square might be worth $5,000, while another five feet square might be worth $5. One antique rug would readily sell at auction for $1,000 and a much larger one might be worth less than one hundred. Unless the assessor were an expert in valuing precious stones, he would be thousands of dollars out of the way in setting a value on the jewelry of hundreds of New York families.

"From the residence of the taxpayer the assessor might then go to the stable, and there he would have to be an expert in valuing horses, harness and carriages, for it would not be difficult to make an error of several thousand dollars in valuing three or four horses.

"Let us suppose that our taxpayer is a merchant, and carries a large stock of goods, then the assessor's next duty would be to value that stock of goods. Every one knows that it would take the merchant's own clerks several weeks to make a correct inventory of his stock, and they would know the actual prices paid for the goods, while the assessor must estimate their value by mere inspection.

"It is perfectly clear that the most skilful man could not possibly make a fair appraisal of even one small department store in a week's time."

Of even more importance to the farming classes are the inequalities in real-estate assessments. It might seem that the assessor, if he be a man of honor and of ordinary intelligence, would be likely to do little injustice to the taxpayers in his assessment of their real estate. If he undervalued the land of one of his constituents or of one part of his district, it is assumed that he would carry the same scale of undervaluation throughout the district and for all of his constituents. Until lately, it has been generally believed, even by students of the subject of taxation, that this assumption was true. Inequalties in the assessment of real estate between the various tax districts were known to exist wherever the local assessments were made the basis of the state assessments, but it was thought that all this would be done away with by abolishing the state levy. Very recent investigations, however, have shown this to be a mistaken idea. The valuation of real estate is by no means a simple matter, and the locally elected tax assessor is seldom an expert in such matters.

The reason for these inequalities is seldom due to intended favoritism on the part of the assessor. It is rather due to his method of determining the value of land for purposes of taxation. This has been well described by the Wisconsin Tax Commission of 1898 in the following words:

"If the assessor is disposed to be fair as between different taxpayers of his district, he will, perhaps, start with some former assessor's value of a particular parcel, or with his own arbitrary modification of such former value, assess the adjoining property by comparison with the first, the next by comparison with the second, and so on till the first standard is virtually lost sight of. When the average assessor once departs from the standard of true value, he speedily comes to have no standard except a sort of comparison between like properties so circumstanced as to be easily compared. It consequently happens, unless the assessor is a person of diligence and unusual judgment, that his valuations soon show wide variations, not only in respect to dissimilar properties and different classes of property, but even as to properties that differ only in ownership."

Besides the under-valuations just referred to which hold true of all classes of real property, there are two classes of real estate the under-valvations of which are so frequent and extreme as to be a constant source of irritation to taxpayers. The first illustration of this occurs whenever the local assessor is called on to determine the value of mineral lands or lands having deposits of oil or gas. It can easily be seen that the local assessor has neither the training necessary to estimate the value of such lands, nor has he the information necessary to enable him to determine the value of the lease-hold when, as usually happens, the mineral or oil rights are leased to other parties.

The other case in which real estate assessments almost invariably fall short of the true value of the property is when the property is not improved but held out of use awaiting a rise in its value. Under such circumstances, the assessor is usually easily made to believe, that since the property is bringing its owner no income in the shape of rents, it would be unfair to tax it at the same rate as land that has been improved. The result of this practice of under-valuation of unimproved property is that the man of energy is punished for his efforts to improve his property by having a high assessment, while the man who fails to improve his property, but relies on the increase of values resulting from the progress of society, is rewarded for his failure to assist in this movement for progress. This form of undervaluation is said to be especially noticeable in Canadian cities, where it seems to have the sanction of law. It affects the farmer, of course, only in connection with the raising of county revenues.

The third defect of the present system.

The third defect of the general property tax is the inequality in assessments between the various counties or other political divisions of the state. The cause of these inequalities, so far as not found in the character or intelligence of the assessors, generally lies in the fact that in most states the practice has been to use the local assessments as the basis for the state levy. By keeping his assessments at less than the average for the state as a whole the local assessor is able to relieve his constituents from their fair share of the state taxes, and as the local assessors are nearly always elected by the taxpayers, there springs up a sharp competition between them to secure the lowest assessments for their districts. In this respect, the Canadian provinces are better off than the American states, since complete separation of provincial and local revenues has always existed throughout the Dominion.

One of the unfortunate consequences of the ordinary methods of making assessments is that a sharp rivalry takes place between the county and the city authorities to throw the burden of taxation on to each other's shoulders. Owing to the high local rates in the cities and perhaps to the greater difficulties in the way of valuing city property, this is a sort of conflict in which the city usually wins. Much of the hostility evidenced in state legislatures or among county commissioners between representatives of city and county districts grows out of this feeling that one class or the other is escaping its fair share of the tax burdens.

The extent to which this under-valuation of city real estate can at times go, was well illustrated by a report made to Mayor Swift, of Chicago, in 1896, by a commission of prominent real estate experts appointed to consider the extent of under-valuation of Chicago city property. These men reported that in the business district of that city the assessed valuation of the real estate constituted but 7.33 per cent of its true value.

Remedying the evils of the present system.

An effort has been made in the progress of this article to show not only that, as a class, the farmers of this country are grievously over-taxed as compared to the residents of our cities, but also that these evils are not due, in the main, to carelessness or to the moral deficiencies of the tax officials as such, but that they are inherent in the tax system. Unfortunately, this fact has not been understood, and the legislatures in nearly all our states, controlled by the farmer vote, have attempted to correct these evils by the enactment of laws making more severe the penalties on taxpayers and assessors for failing to return all property for taxation at its true value, or by offering rewards to certain persons, known as tax inquisitors or ferrets, who would undertake to discover hidden property and secure its listing for tax purposes.

No state has made a more strenuous effort in this direction than the state of Ohio, and the history of its efforts in this direction should prove instructive to those persons who are still inclined to believe that the general property tax can be made effective if sufficient efforts are made to enforce the laws. The laws of Ohio have for a long time been among the severest in the Union in their requirements concerning the listing of property, compelling an oath from the taxpayer as to the correctness of his return and imposing severe penalties on both the assessor and the taxpayer for false statements or failure to make returns.

Not satisfied with these requirements, but convinced that, in spite of them, personal property in the large cities was escaping taxation, the legislature in 1885 passed an act, at first applicable only to certain counties but later extended to the entire state, by which county commissioners were authorized to make a contract with such persons as agreed to secure information that would result in placing concealed personal property upon the tax duplicate.

After nine years of experience with this law, the Ohio Tax Commission of 1893, having made a careful investigation as to the results of its operation, reported that, in the two leading counties of the state which contain the cities of Cleveland and Cincinnati, the Tax Inquisitor Law had added to the tax duplicate about one per cent of the entire amount collected, and that 34 per cent of the the amount so discovered had been given to the tax inquisitors, county auditors and treasurers for their work of discovery and listing.

In the state, as a whole, in 1891, the gross amount collected through the operation of the Tax Inquisitor Law was about $750,000. "This", says the Commission, "is about 2 per cent of the entire taxes of the state. It is thus demonstrated that the operation of this scheme, like all other attempts to reach intangible property, follows the universal law of which so many illustrations have been adduced, that the large cities escape and the country counties feel its burden. The law was first made applicable to the large cities only, yet in its actual operation it is the country counties which pay the weight of the tax, and on which it rests with severity."

After remaining in operation for more than twenty years, causing constant irritation and giving rise to frequent suspicions of political corruption and personal favoritism, the Tax Inquisitor Law was finally declared unconstitutional by the Supreme Court of the state. There has been no falling off in the amount of personal property assessed since the law was declared unconstitutional. On the contrary, the usual slight increase from year to year has taken place.

In other states where efforts have been made to revise the laws in the direction of securing a more complete return of personal property for purposes of taxation, similar failures have resulted. Usually under the inspiration of the new laws the officials have been for a time a little more diligent, and the taxpayers have revealed a little more of their holdings until they have discovered new ways of evading the laws. Then the practice of assessment soon reveals the same degenerate aspects as before.

The only certain and efficient remedy for the evils of the general property tax, in so far as it applies to personal property, is to omit personal property altogether from the assessment rolls and to confine the taxation of property to its original and proper field, viz., real estate. The announcement of such a radical program for the revision of our taxing laws will at once strike the reader who is not familiar with the history of tax reform in this country and abroad as a confession of failure,—a surrender to the forces of evil as represented by those persons who, for years, have pursued a persistent policy of tax-dodging.

Those who advocate the abolition of the tax on personal property do not intend to convey the idea that persons whose wealth consists in part or in whole of personal property, shall thereby be allowed to escape paying their full share of the expenses required to meet the needs of our state and local governments. Accompanying this recommendation for the abolition of the personal property tax go other recommendations concerning practicable substitutes for such a tax.

A single tax on land values.

One important school of reformers has, it is true, suggested that in lieu of all other taxes there be imposed a single tax on land values. This measure, as proposed by its chief advocate, the late Henry George, was intended less as a means of fiscal reform than as a means of social regeneration. It would, he believed, abolish poverty and solve the labor problem.

The theory on which Mr. George based his proposed scheme of reform was that all land rents and every increase in the value of land are the results of social progress and are not due to individual effort on the part of land owners. By allowing land owners to reap the rewards of social progress, inequalities of wealth are created and poverty results. By putting a tax on the land equal to its annual rental value, society as a whole should claim for itself what society had itself produced, and other forms of property, which Mr. George believed to be the result of individual exertion, would thus be freed altogether from taxation.

Among living advocates of the single tax there are some who accept George's theory as to the cause of rent and of the unequal distribution of wealth but who seem content to accept a less radical plan of reform. Instead of confiscating at once all land rents, they would take by taxation only what was needed to meet necessary governmental expenditures.

While conceding that land rents are largely the result of social progress, the present writer does not believe that these are the only social values thus created, nor does he believe that social progress always results in an increase of land values. His suggestions for reforms in taxation therefore proceed from a different point of view than that of the single-tax advocates.

Some suggested reforms in taxation.

While there is, of course, much difference of opinion among authorities on the subject of taxation, concerning the details of a proposed program of tax reform for American states and cities, there is practical unanimity among conservative writers as to the principal features of this program. In fact, so far has agreement proceeded that within the last decade many of these reform measures have found expression in the legislation of a few of our states. Most important of these measures is the method being rapidly introduced for reaching the holders of the intangible personalty.

Intangible personal property, we have seen, consists mainly in money on deposit, credits, such as promissory notes, mortgages, and the like, and stocks and bonds issued either by governmental authority or by private corporations. It is now generally recognized that the taxation of the bonds issued by our states or by political subdivisions, counties, townships, cities, and school districts, accomplishes no useful purpose and is a needless expense to the government that attempts it. For a government to tax its own securities and then pay interest to the holder in order that he may pay the taxes is a worse than useless procedure, for not only will the government be obliged to pay for the taxing machinery necessary to accomplish this purpose, but it will also pay out more in the shape of additional interest than it will get back in the shape of taxes. This is because the tax rate is subject to fluctuations and the investor in government securities will require that the interest rates be high enough to insure him against these fluctuations. If the investor is, by the terms of his contract, guaranteed freedom from taxation on the bonds that he holds he will gladly accept lower rates of interest. Competition among investors offers him no alternative but to do so.

Taxation of mortgages.

This principle, which is now so generally recognized in connection with government loans, that guaranteed freedom from taxation reduces the rate of interest to the borrower by as much as, or even more than, the average tax rate, holds true in the case of all credits and the same freedom of taxation should be extended to them. The most serious objection that farmers as a class are inclined to raise against this plan comes up the moment it is suggested that mortgages be exempt altogether from taxation. Although, the principle is precisely the same as in the case of the exemption of state and municipal bonds, it seems advisable to devote some attention to the subject of mortgage taxation and to show that such taxation is always harmful and that when it has been attempted it has defeated its very purpose.

The argument is often made that even if certain forms of intangible property do escape taxation, there is no reason why mortgages can not be taxed. Since mortgages are usually, though not always, recorded, it is said that all that a conscientious tax assessor needs to do is to consult the records in order to place these investments upon the tax duplicate. Passing over some of the difficulties in the way of listing such property for purposes of taxation, we will assume for purpose of argument that mortgages are actually reached in all cases and that their holders are assessed the full tax rates of the general property tax on their investments.

Now, men who have funds to loan on farm mortgages are not limited to this class of investments. A very large proportion of the money actually loaned on farm mortgages consists of the accumulated resources of insurance companies, banks, trust companies and similar financial institutions. These business associations, as well as individual money lenders, are interested primarily in the net return they will receive on their investments. If now, mortgages are made taxable by law and the machinery for levying and collecting the tax is so well devised that the attempt to tax these investments actually succeeds, while other forms of investments can not be reached, it is evident that money lenders will demand higher rates of interest on the taxed than on the untaxed investment. The result, therefore, is that the tax is shifted from the mortgagee to the mortgagor in the shape of higher interest rates and the rate is even made a little higher than the average tax rate, in order to compensate the lender for the risks he takes of having the tax rate increased. The mortgagor not only pays these higher interest rates but in nearly all of our states is taxed on the full value of his mortgaged property in the same way he would be if the property bore no incumbrance. In Canada, mortgages as such are not subject to taxation, but the income from the mortgage investments is taxed as a part of the personal income tax.

In the case of the taxation of credits, it is the general policy in many of our states, though one of doubtful expediency, to permit the creditor to deduct the full amount of his indebtedness before returning these credits for purposes of taxation. No such deduction is, however, generally allowed to the owner of mortgaged real estate, so that double taxation results, and, as we have just seen, the practical results are that the mortgagor pays both taxes. In those states in which the tax assessor is not required by law to consult the mortgage records in order to discover the holders of mortgages, these investments along with other intangible personalty usually escape taxation.

The proof of this is seen in such a relation between the tax rates and the interest rates on loanable capital, as was reported by the Chairman of the Revenue Commission of Colorado, in 1901. In his report to the state senate, he said: "We have carried the principle of general property taxation, to such an extent that we pretend, as a matter of law, to tax both the mortgaged premises and the owner of the mortgage. The result is, the double taxation of a most unfortunate class, the debtor class, in so far as the law is enforced at all; but, of course, the pretense of enforcement becomes ridiculous in cities like my own, where money is loaned on mortgages at 8 per cent, and the rate of taxation is between 7 and 8 per cent. The state can not acquire interest by taxation, and any attempt to do so must result in higher rates of interest and the withdrawal of capital from the contest. Interest rates in Colorado are very high, and I am convinced would be materially decreased by the repeal of the tax on credits. The tax on credits in this state, while producing but little revenue is, nevertheless, a club in the hands of banks and money-loaners to keep outside money from coming in, and to keep up high rates of interest." It should be said, in passing, that since the above was written, mortgage notes in Colorado are, by law, exempt from taxation.

We are, however, not left to theory, alone, in judging of the effect on interest rates resulting from the taxation of mortgages or from legally exempting them from taxation. The state of California in its constitution of 1879, provided that: "A mortgage, deed of trust, contract, or other obligation by which a debt is secured, shall, for the purposes of taxation and assessment, be deemed and treated as an interest in the property affected thereby.

"The value of the property affected by such mortgage, less the value of such security, shall be assessed and taxed to the owner of the property, and the value of such security shall be assessed to the owner thereof." Elsewhere in the constitution it is provided that a contract entered into between a debtor and creditor by which the former agrees to pay the tax on the money loaned by the latter, shall be null and void, and no interest can be collected on mortgages affected by such a contract. With these iron-clad restrictions placed in the fundamental law of the state, the result for some years was that the mortgagee actually did pay the tax on the mortgage. An investigation made by Professor Plehn, of the University of California, in 1897, showed that the average rate of taxation for state and local puposes in California was about 1.75 per cent, and that the average rate of interest upon mortgages in California, for the decade 1880–1889 was 8.90 per cent, or "exactly 2 per cent more than the average throughout the United States, which was 6.90."

It was likewise shown that for a period of about nineteen years, January 1, 1880 to October, 1898, "the average rate of interest on first-class mortgage loans in San Francisco subject to taxation was 6.81 per cent, and on first-class commercial paper held by San Francisco's banks practically untaxed, was 4.73 per cent, the difference between the two classes of credits in the average interest rate being 2.08 per cent. Since the average rate of taxation in San Francisco during this time was only about 1.7 per cent. it appears that the rate of interest on the mortgage loans was enough higher than that on untaxed credits to cover the tax and about one-third of 1 per cent, in addition to cover the cost of shifting the tax from the creditor to the debtor."

Another and perhaps even more instructive example of the results of mortgage taxation on interest rates is shown by an investigation conducted by Mr. Lawson Purdy concerning the rates of interest charged on mortgage loans, in Massachusetts, New York and Pennsylvania. These are all industrial and commercial states of the first rank. There is in all three states usually a good supply of loanable capital free to accept good investment. The argument that might be made that in California the high rate of interest on mortgaged real estate was due to a lack of loanable capital within the state could therefore not be made to apply to these three states.

Now, in Massachusetts since 1881, it has been lawful for the mortgagor and the mortgagee to do precisely what the California constitution forbids, viz., to enter into any contract they please as to the payment of the mortgage. In case the mortgage is returned for taxation, the land is assessed only at its selling value less the amount of the mortgage. If the mortgage is not returned for taxation, the land is assessed at its full value, and no attempt is then made to tax the mortgage. Under this law it is almost the universal rule for the mortgagor to pay all the tax.

The Massachusetts Tax Commission of 1897 had statistical evidence submitted to it which showed that the change in the law made in 1881 brought with it a lowering of the interest rate, and the Commission said: "It is not to be questioned that the competition in mortgage investments has been greatly increased by the change in the law, and that the tendency has been for the rate of interest on well-secured mortgages to go down."

In Pennsylvania, mortgages are subject to taxation, for state purposes only, without deduction for debt, at the rate of four mills per annum, and the machinery for assessment is so arranged that assessors are able to list the great majority of them for taxation. It is generally understood in Pennsylvania that the rate of interest on mortgages is raised by about the amount of this tax. In New York prior to July 1, 1905 mortgages were taxable like other forms of taxable personal property but holders of mortgages were allowed to deduct their indebtedness before returning their property for purposes of taxation.

Inasmuch as no special methods were provided for their assessment, very few mortgages were listed for taxation. Nevertheless, investigation tended to show that fear of taxation led many lenders of money to hesitate to lend money on mortgage security and the rates of interest on mortgage notes were accordingly raised on an average throughout the state by about one-half of 1 per cent. Investigation further showed that, under this law, the rates of interest on mortgage investments in rural counties in New York exceeded the rates in rural counties in Massachusetts similarly situated by an amount varying from 0.32 to 0.56 of 1 per cent.

Acting on this information, the New York legislature passed a law that went into effect July 1, 1905, whereby all mortgages recorded thereafter were subject to taxation at the rate of one-half of 1 per cent per annum. The idea underlying this law was that since interest rates on mortgages were raised by about one-half of 1 per cent, due to the fear of taxation, the state might reap the benefit of this increase by agreeing to relieve mortgages from taxation beyond this amount, without in any way affecting the rate of interest collected from the lender. No reduction was to be allowed the mortgagee for indebtedness and the tax was to be paid at the recording office.

The results under this law were not what had been hoped for. The certainty that new mortgage loans would be taxed when recorded caused a reduction in the amount of money loaned and an increase in the rates of interest. "The amount of money actually loaned was very little more than half as much in 1905 as in 1904. In 1904, there was less than $1,000,000 loaned at 5½ per cent, in 1905 over $15,000,000. In 1904, more than $44,000,000 was loaned at less than 5 per cent, and in 1905 less than $7,000,000. In 1904, over $5,000,000 was loaned at 4 per cent, in 1905 less than $1,500,000."

Interest rates on mortgage loans.

We are now ready to make a comparison of the interest rates on mortgage loans in the three states, Pennsylvania, New York and Massachusetts. For this purpose, we select country counties as being those best suited to the purposes of this article, although a comparison of the city counties shows the same general results.

Erie county, Pennsylvania, is immediately adjacent to Chautauqua county, New York. Both counties have approximately the same population, and, being in the western parts of their respective states, are far enough distant from the New York and Philadelphia money markets to have the rate of interest on their loans appreciably affected by this distance. Columbia and Rensselaer counties, in New York, are immediately adjacent to Berkshire county, Massachusetts, and all three counties are near enough to New York city to secure the advantages of proximity to the loan market. The results of the different tax laws in the three states, both before and after the change in the New York laws, is shown in the following table, which shows in quite a striking manner the increase in 1905 in the percentage of money loaned in Columbia and Rensselaer counties, New York, at rates of interest above 5 per cent, and a corresponding decrease in the percentage of loans made at 5 per cent or less than 5 per cent rates. In Erie county, Pennsylvania, and in Berkshire county, Massachusetts, it will be noticed the change was inconsiderable:

	Average rate of interest, per cent		Percentage of loans at over 5 per cent rates		Percentage of loans at 5 per cent rates		Percentage of loans at less than 5 per cent rates	
	1904	1905	1904	1905	1904	1905	1904	1905
Erie county, Pa.	5.57	5.53	63.7	59.9	32.8	37.0	03.5	04.0
Chautauqua county, N. Y.	5.62	5.71	67.0	79.1	28.0	19.0	05.0	01.9
Columbia county, N. Y. .	5.37	5.78	39.4	83.0	59.2	16.3	01.4	00.7
Rensselaer county, N. Y. .	5.25	5.54	38.5	67.7	43.4	31.5	18.1	00.8
Berkshire county, Mass. .	5.03	5.03	10.3	10.8	77.7	77.8	12.0	11.4

It will be noticed in the above table that fear of taxation in New York state was sufficient to keep the rate of interest in Chautauqua county, in 1904, slightly above the rate in the adjoining county in Pennsylvania, where mortgage loans were being taxed at the uniform rate of four mills on the dollar per annum, and it also kept the rate in the eastern counties of New York considerably above the rate in Massachusetts, where the borrower pays the tax. After the change in the New York tax laws, in 1905, it was certain that new mortgages recorded would be obliged to pay the rate of five mills on the dollar per annum. This, as the table shows, caused an immediate increase in the tax rate in all the New York counties, although at the same time the rate slightly declined in Pennsylvania and remained constant in Massachusetts.

The discovery of the facts just given and their presentation to the legislature resulted in another change in the laws for the taxation of mortgage loans in New York. The new law, which went into effect July 1, 1906, provides that in place of the annual tax of one-half of 1 per cent paid *annually*, there shall be paid on all mortgages recorded after that date a recording tax (or more properly a fee) of fifty cents on each hundred dollars and such mortgages are then exempt from taxation as personal property. Amendments have since been adopted whereby mortgages recorded prior to July 1, 1906, may share in the advantages of the new law.

The effect of the change in the law has been very good, so far as observation goes. Figures are not available for the country counties, but in New York county during the eight months following the going into effect of the law the average rate of interest on mortgages had fallen from 5.54 to 5.15 per cent. Mr. Pleydell, secretary of the New York Tax Reform Association, writes: "It is gratifying to be able to show that the recording tax law has lowered the average rate of interest, that it has increased the amount of money loaned at 5 per cent or less, and that it has brought more money into the mortgage market; and this despite the admittedly adverse conditions of the money market."

Minnesota in 1907 enacted a registry tax for mortgages in that state almost precisely the same as the present New York law. In Wisconsin, in 1903 a law was adopted for the taxation of mortgages very similar to that now in force in Massachusetts whereby the mortgage is taxed as an interest in the property but the mortgager may agree by contract with the mortgagee to pay the tax on the mortgage. An investigation of the effects of this law has been made by experts employed by the Wisconsin Tax Commission but the results obtained are not complete and are in a measure contradictory. Professor T. S. Adams, who had charge of the investigation, admits that the statistics gathered are hard to interpret and the results are inconclusive.

The general conclusion at which we arrive from our study of the subject is that the taxation of mortgages accomplishes no useful purpose. If it succeeds it does so only by expensive administrative methods, and lessens the amount of money available for loans on this class of security. It results in contracts whereby the borrower agrees to pay the tax or, if this contract is forbidden by law, the tax is shifted to the borrower in the form of higher interest rates. In addition to these defects, the general practice of requiring the assessment of both real estate and mortgages at their full values is double taxation of the worst sort, and discriminates against those least able to pay taxes,—the debtor class. The conclusions of a leading tax official of the state of Michigan may well be commended to the attention of farmers elsewhere. "The farmers of the state and borrowers generally are beginning to learn that to get low rates of interest, the money loaner must be relieved of high rates of taxation. What the people of Michigan want is a low rate of interest, and that would far more than compensate the small amount of taxes received upon mortgage credits."

The conclusion reached concerning the desirability of exempting from taxation state and municipal bonds and real estate mortgages, for the same reasons, applies with equal force to the tax upon bank deposits, and statistics show that a very small percentage of these deposits are actually listed for taxation. Even if this were done, it would require inquisitorial methods, and would inevitably result in a withdrawal of deposits at the time the tax lists were being made up. Even at present, this is oftentimes done, and it is a fact well known to bankers that the deposits in banks reach their lowest figure every year on the day on which they are presumed to be listed for purposes of taxation. Since banks collect deposits only in order to loan them out again, a serious effort to list them for purposes of taxation would doubtless cause such a sudden contraction in the loans as to bring about many business failures.

Stocks and bonds of corporations.

There remains for consideration among important classes of intangible personal property only the stocks and bonds issued by private corporations. These are as difficult as any other species of property to discover in the hands of their owners, since they are usually negotiable and frequently change hands. Their value is also hard to determine when this is left to the local assessor. Fortunately, it is neither necessary nor desirable to discover the holders of these securities in order that they shall be made to contribute their share of taxes. These forms of investment may be reached much more effectively by means of a tax imposed directly on the corporation.

Such a method is not only more effective, but it fits in with the theory and practice of our corporation laws and court decisions. The corporation is an artificial person, and in all business matters is treated as a person. What is more natural than that it should be treated the same way when the question of taxation is being considered? It is not necessary to discuss here the method of taxation; whether the tax should be assessed on the value of the corporation's property, on its gross receipts, its net receipts, or be proportioned to the volume of business done. It is advisable, however, to remark that, if property is taken as the basis of taxation, it is necessary to include more than the mere tangible property. Oftentimes a corporation's most valuable asset is its franchise, i. e., its right to do business as a corporation. This has been, up to the present time, the most serious defect in the Canadian system of taxation. Until late years there has been very little effort made in the provinces to reach the intangible property of corporations for the purpose of taxation.

Success in taxing corporations requires that the assessment shall not be placed in the hands of the local assessors, but that full reports shall be required from corporations as to the extent of their business and the amount of their receipts, and that the assessing be placed in the hands of a permanent tax commission consisting of experts capable of interpreting corporation accounts. This commission must have the power of inspecting the books of the corporation in order to determine the accuracy of the statements rendered.

Fortunately, there are now few states in which the attempt is made to reach corporate property only by means of a tax on the holders of stocks and bonds, though there are a few states in which the injustice of taxing the corporation and then levying another tax on the stockholders is still perpetrated. This, theoretically, amounts to double taxation, but owing to the facility with which stocks are concealed, the tax upon them is seldom levied in practice.

Substitutes for personal property tax.

The question arises, What can be made to take the place of the personal property tax in our cities, if the owners of such personalty are to contribute their fair share of the revenues? Besides the corporation taxes, which take the place of the taxes on stocks and bonds, a system of classified business taxes might well be substituted for the tax on merchants' and manufacturers' stocks. This tax might also be extended to the various professions. Our southern states and Canadian cities already have such a system of taxes. While, perhaps, the classification and mode of assessment are sometimes careless in those states, such taxes have proved very successful in European countries.

In addition to such taxes, proposals have been made that differences in ability to bear taxes in our cities be measured by means either of an income tax classified according to the nature of the income and its amount, or by means of a habitation tax, which judges of a man's financial ability according to the rental value of the house he occupies. It is not our purpose to discuss here the merits or defects of either of these modes of taxation. Both have their supporters and their critics. Both are found in actual practice in various countries and, provided certain conditions as to modes of assessment and collection are met, seem capable of serving as a satisfactory substitute for the personal property tax. The Canadian income taxes are faulty both in theory and in their administration, and do not satisfy the requirements of a satisfactory substitute for the personal property tax.

Separation of state and local revenues.

The acceptance of the system of taxation just suggested or something similar thereto would make possible another much needed reform, viz., the complete separation of state and local revenues. Corporations of a semi-public character must be taxed by the state authorities if such taxation is to be successful. These taxes supplemented by inheritance taxes on both direct and collateral heirs can be made in nearly all cases to yield sufficient revenue to defray the expenses of the state governments, and sometimes will even yield a surplus that may be distributed among the counties or towns, as the case may be.

This separation solves at once one of the three great evils of the present system of taxation. The inequalities in the assessment of like property that result in the different tax districts from the efforts of the tax assessors to keep the valuation of property within their districts low would be eliminated. This motive would no longer be present when state and local taxes did not rest on the same assessment. Such a separation of state and local revenues already exists, as we have seen, in Canada, and is gradually being realized by the American commonwealths.

The third great evil of the present system of taxation is, as we have seen, the inequalities in the assessments of the same kind of property belonging to different persons, residing in the same tax district. Several remedies have been suggested, but the one that has so far proved most efficient in practice is the Wisconsin method of securing a state revision and correction of the local assessments of real estate. A permanent state tax commission was created by legislative enactment in 1899, and to this commission the register of deeds in every county reports annually the sales of real estate made within his county during the year, together with the consideration paid and the tax assessment of the property for that year. The tax commission describes its own method of reaching the true value as follows: "From the three known quantities, — the consideration paid, the assessed values of the lands sold, and the total assessed valuations of the district, — the fourth or unknown quantity, the full valuation of the real estate of the district, was easily ascertained. The formula would stand thus: As the assessed valuation of the lands sold is to the consideration paid for them, so is the assessed valuation of the real estate of the district to the full market value thereof."

The success of this system of assessment revision in bringing up the assessment of real estate to something like its full value and thus equalizing the assessment of such property throughout the state was almost startling. Beginning with 1900, the new state tax commission began the task of instructing local assessors as to the proper methods of assessing property for purposes of taxation. The results of its efforts to improve the work of the local assessors, as well as to bring up the valuation of real estate to approximately its true value, are shown in the following table. Since the state assessment is in each year based on the local assessment of the preceding year, the local assessments in the table are always given for the year immediately preceding the year of the state assessment.

Year	State assessment	Per cent Increase	Year	Local assessment	Per cent Increase	Ratio of local to state Per cent
1906	$1,671,142,204	10.42	1905 . . .	$1,169,451,206	1.98	69.98
1905	1,513,335,382	6.37	1904 . . .	1,146,813,692	2.40	75.58
1904	1,422,621,485	8.63	1903 . . .	1,119,992,057	3.11	78.73
1903	1,309,504,464	6.78	1902 . . .	1,086,111,947	23.59	82.94
1902	1,226,376,073	3.37	1901 . . .	878,911,348	46.59	71.65
1901	1,186,349,139	135.53	1900 . . .	599,540,595	13.41	50.53
1900	503,690,767	—.31	1899 . . .	528,572,241	1.70	104.92
1899	505,263,975	. . .	1898 . . .	519,713,000	. . .	102.86

One of the gratifying results of the operation of a permanent tax commission acting as a state board of assessment is the success that it has attained in educating local assessors to the better accomplishment of their tasks. Nevertheless, the slow rate of advance in the local assessments during the later years seems to indicate that at best the local assessors are able only imperfectly to perform the difficult task of determining the true value of real estate. Such a careful comparison as the state tax commission is in a position to make between the assessed values and the actual selling values seems necessary to secure satisfactory assessments.

Conclusion.

Thus we have seen the defects of our present system of state and local taxation; the unequal burden that this system has placed on the farming class, and the main lines to be pursued in any effective system of reform. Too often it has been the farmers themselves who have been responsible for the failure to obtain relief from the present burdensome system.

Many of our state constitutions, adopted at a time when conditions of life were much simpler, when property consisted mainly of land and a few kinds of tangible personalty, and when corporations as business organizations were almost unknown, contain a clause that requires the assessment of all property, real and personal, by a uniform rule. The courts have usually interpreted these constitutional provisions in a strict manner, and efforts to amend the constitutions so as to permit the classification of property for purposes of taxation, or to relieve personal property altogether, have frequently been defeated by the farmer vote. This, of course, has been due to the feeling that the exemption of personal property meant the exemption of personal property owners from taxation. It is hoped that it has been made clear that such is not the intention of the supporters of such a measure. The New York Tax Reform Association well states the obstacle to be overcome when it says: "No legislature will venture to enact a good system of local taxation until the people, especially the farmers, perceive the correct principles of taxation and see the folly of taxing personal property."

Fortunately for the cause of tax reform, an intelligent appreciation of the difficulties in the way of taxing personal property has recently been shown in those states in which the evils resulting from efforts to tax personalty have been greatest. In such states as Massachusetts, New York, New Jersey, Michigan, Wisconsin and Minnesota, great strides have been made in the way of exempting personal property from taxation, in improving the corporation taxes which afford the best substitute for the personal property tax, and in separating the sources of state and local revenues, and thus removing one temptation to undervalue property for purposes of assessment.

In other states the subject of tax reform for some time has received and still is receiving careful and intelligent discussion and consideration. It is hardly too much, therefore, to expect that the end of another decade will see great progress in the way of arriving at a rational and equitable system of taxation.

CHAPTER VI

BUSINESS ORGANIZATION IN AGRICULTURE

FORMS OF BUSINESS OR COMMERCIAL ASSOCIATION are many and widespread in the United States and Canada. This association is of three general kinds: Associative production, as in creameries and cheese factories; associative transporting and selling by means of numerous organizations; associative buying of home and farm supplies, which is yet little developed in this country. Another important form of association, but practically not known in North America, is concerned with agricultural credit, operating through various forms of banking and money-loaning organizations: some form of coöperative credit would probably benefit our agriculture.

Business association may be capitalistic or coöperative in its organization. Many of the so-called coöperative groups are only partially or imperfectly mutual, as most of the creamery and similar companies. A coöperative organization is an open group in which all participants share and share alike in proportion to their contribution, and in which the directorate is created genuinely by the parties to the association. It is a membership group. Fully coöperative associations are often not able to do business as effectively as the close or capitalistic associations, because they are likely to lack strong leadership, because there is little opportunity for any one member to acquire wealth, and because we have not yet learned how. Theoretically, the coöperative business society is preferable, because it is natively democratic and should be the means of educating its members and developing the community. The very fact that it does not offer great money reward for any one person is the best reason for its existence: it is altruistic rather than selfish, working for the good of all rather than for a few. Its chief effect is educational. Real and effective coöperative organization is possible only in a highly developed society, because it thrives in proportion as mere self-interest recedes.

Counting all the business associations that exist among farmers, the number is great and the membership is legion. Some of the shipping and selling companies are highly organized and are models of effectiveness. It must not be concluded from these facts, however, that rural commercial organizations are yet exerting powerful influence on farming as a whole. The institutions that will do the most for agriculture and country life will come natively out of the land, rather than be imposed by outside trading interests. It is probably little recognized how extensive is association of one kind or another in North America, notwithstanding the newness of the country and the distances; this chapter and the next will give some idea of it. There has been no careful study of such organizations by any supervising authority, and therefore no direction of them. They need to be studied as carefully as do methods of crop-growing or animal-breeding, in order that helpful coördination and development may be suggested. Some of them are no doubt founded on wrong economic principles. The experience of some European countries might help us.

The word organization as intended in the heading of this chapter refers to any group of persons working together for a common economic purpose, whether the group is formal or informal. It may not be a by-law society, but only the indefinite coming together of persons desiring good roads, or the competitive association of marketmen. Informal organizations are often the most effective, because they are likely to be impelled by forces that arise spontaneously out of the business.

Accounting: two kinds.

It is intended in this chapter, as elsewhere in this volume, to consider public or community relations. Community interest in business rests directly, however, on the profit efficiency of the individual farm; therefore it has seemed to be wise to include a discussion of farm accounting and of the cost of farm products.

Many attempts have been made to adapt a book-keeping system to farm business. Various kinds of blank books have been offered from time to time by farm journals and others. There are also such books as Roberts' "The Farmer's Business Handbook" (The Macmillan Company), Card's "Farm Management" (Doubleday, Page & Co.), Vye's "Farm Accounts" (published by the author at St. Anthony Park, St. Paul, Minn.), Steiner's "How to Keep Farm Accounts" (Steiner & Co., Toledo). A much simplified method is explained by Stone in the article that follows. The importance of keeping farm book-accounts cannot be over-estimated, for farming should be as effective on its business side as on its produce-making side. It is probable that no other business followed for sole support could long survive the lack of an accounting system; yet, in spite of the losses that might be checked up by such a system, the business continues to prosper.

Another type of farm book-keeping is what may be called estate-accounting. This is little known or appreciated in this country, for we have few well-directed large agricultural estates that remain for any length of time under a continuing management. This type is in the nature of a consecutive record, from owner to owner, accompanied by maps and plans of the subdivisions of the property, with an idea to permanency of results. The farm may be that of an educational institution or of private ownership. The performance of the different fields or subdivisions may be determined through a long series of years. Often the records of private estates in Europe are published for private or even public distribution. Such records afford the best data for the study of farm management. Some of the European studies in this field make comprehensive and philosophical volumes: the problem is more difficult than that of factory accounting. Dr. Hugo Wendorff's "Zwei Jahrhunderte landwirtschaftlicher Entwickelung auf drei gräflich Stolberg-Wernigeroder Domänen" (Parey, Berlin, 1890) is an illustration of this type of study. This phase or kind of farm accounting relates the farm in a very positive way to the welfare of the community, and therefore affords a basis for social studies. The Editor does not know of any comparable record of this kind in North America, for discussion in this volume. The student of the philosophy of the wisest farm organization will not overlook the pieces of foreign literature in this field.

A SIMPLE SYSTEM OF COMMON FARM ACCOUNTING[1]

By *John L. Stone*

The business side of farming as distinguished from production is coming to receive more and more attention. It is recognized that financial success depends as much on ability to employ business-like methods in conducting the various activities connected with farming as on a knowledge of the laws of plant- and animal-production. Business methods are practically impossible without a fairly effective method of recording business transactions. A few men are blessed with such rare memories that they can carry "in their heads" their farm affairs so well that their business does not seriously suffer for want of records. Most persons cannot do this, and most farmers do not attempt an adequate system of accounts. It is probable that more farmers fail of financial success from a lack of business methods and proper records than from ignorance in handling land, plants and animals, and in making them to thrive.

As the general education of farmers advances, more of them will have the ability to keep satisfactory accounts; and as our agricultural colleges and schools are turning out increasingly large numbers of trained young men and young women who go back to the farms, there ought to be an increasing number of farms on which thorough records are kept and business methods employed. Those who aim to become managers of the estates of wealthy men and of important commercial farm properties can scarcely escape the necessity of mastering a method that will enable them to make a fairly complete showing of their transactions.

Purpose of accounts.

Accounts are kept for several distinct purposes: (1) That the business relations entered into between the farmer and others may at all times be clearly shown; (2) that the farmer may know at certain times the actual net worth of his possessions; (3) that he may know the increase in wealth or the net gain that he has made in a definite period; (4) that the farmer may know at the end of the year which departments of his business have been conducted at a profit and which at a loss. A thorough and complete system of accounts will accomplish all of these purposes. The use of such a system, however, implies some knowledge of accounting.

The single-entry ledger.

No farmer should attempt to get along without making a permanent and clear record of all transactions between himself and others that are not completed at the time. If John Jones has engaged to work for a farmer for the season at $35 per month and receives partial payment in cash or farm produce at intervals and sells to the farmer a young Collie dog that he has raised and trained, the record at the end of a month might stand thus:

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[1] The methods of double-entry accounting described in this article are in the main based on Roberts' system, and the data used in illustrating the accounts are largely the same as given by him.

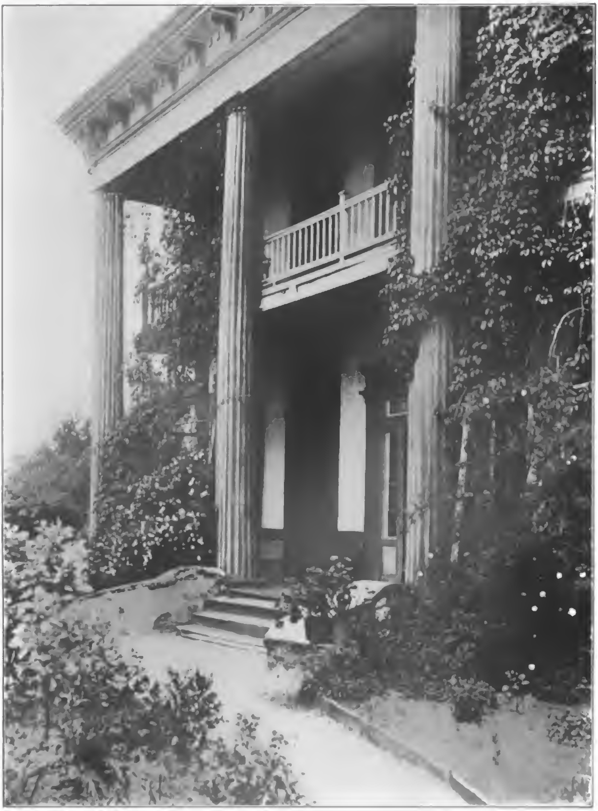


Plate XI. A Southern homestead of the older kind. Alabama

TABLE I.

Dr. 1907	John Jones			1907	John Jones		Cr.
April 5	To 5 bus. potatoes at 50 cts.	$2 50		April 1	Began work at $35 per month		
April 8	To cash	10 00		April 10	By 1 collie dog . . .	$5 00	
April 13	To 100 lbs. B. W. flour at 2½ cts.	2 50		April 16–17	Absent 2 days . . .		
April 15	To cash	10 00		April 30	By 1 mo. wages, $35.00 Less 2 days . . 2.69		
			$25 00			32 31	$37 31
April 30	To cash to bal. acct. .		12 31				
			$37 31				$37 31

The account is balanced and closed at the end of one month. Ordinarily this would not be done until the end of the season. Should Jones continue in the service of the farmer for a series of years, the account would regularly be balanced and closed once a year and a new account opened. Should the farmer owe Jones at the end of the year $25, which he does not pay at the time, there should be entered on the debit side of Jones' account, in order to close the account, "To balance carried to new account, $25," and on the credit side of the new account, "By balance from old account, $25." It is well to make these entries in red ink to distinguish them from ordinary transactions. Accounts similar to that in the diagram should be opened with every person with whom the farmer has incompleted business transactions.

The single-entry ledger is also well adapted to keeping accounts of the individual crops, such as corn or potatoes and of the departments of the business, for example, live-stock. The crop account should be charged with the expenses, such as seed, fertilizer, and labor, and credited with the product. Unless there is inaugurated on the farm, however, a system of daily work records, the labor charged up to the crop in such a case is likely to be a mere estimate.

Still further use of the single-entry ledger may be made by keeping an account with Cash. For example, a certain farmer, as an accountant, keeps a record of all money received. All money that he receives is debited on the Cash account (just as in the case of John Jones) and everything that he pays out (that is, all cash paid out) is credited on the same account (entered on the credit side of Cash account).

Such a record will enable the farmer to know what have been his receipts and expenditures during the year, and if he chooses he can sort out the items pertaining to any particular line and bring them together, as feed purchased for stock, for instance.

While a complete record of this kind is desirable and valuable, the labor involved in keeping it is so nearly equal to that of keeping a double-entry system that the farmer might better, with a little more work, master the latter.

Before leaving the single-entry ledger, attention should be called to the fact that a modification of the form used in Table I is often desirable. The double-page ledger is sometimes objectionable because one side of the account has many more items than the other. On a milk farm, the income may be almost entirely from milk sold, the pay for which comes in the form of a check at the end of the month and is entered on one line on the debit side of cash account. The expenditure of this money may involve one hundred items that are entered on the credit side of cash account.

On account of this tendency for one side of the account in a double-page ledger to run ahead of the other, it is sometimes desirable to keep both debits and credits on the same page, using the right-hand pair of dollars-and-cents columns for the credits and the left-hand pair for debits. In this case, the descriptions of the transactions would be intermingled but distinguished by the column into which the amount is carried and the debits by being preceded by the word "to" while the credits are preceded by "by." There is somewhat greater liability of error from placing the amounts in the wrong column when using the single-page ledger than of getting them on the wrong page in the case of the two-page ledger.

The account with John Jones which has been stated above, written in single-page form would be as follows :

TABLE II.

1907	John Jones	Dr.	Cr.
April 1	Began work at $35 per mo.		
April 5	To 5 bus. potatoes at 50 cts	$2 50	
April 8	To cash	10 00	
April 10	By 1 collie dog		$5 00
April 13	To 100 lbs. buckwheat flour at 2½ cts.	2 50	
April 15	To cash	10 00	
April 16–17	Absent 2 days		
April 30	By 1 mo. wages . . $35.00 Less 2 days lost . . 2.69		
			32 31
April 30	To cash to balance account	$12 31	
		$37 31	$37 31

The inventory.

While the single-entry ledger system, if properly kept, enables the farmer to square himself with his fellows, it, alone, will not give him definite knowledge of his own wealth or the amount of gain or loss in a year. Even the carefully kept cash account will not do this ; for, while it shows total receipts and total expenditures, it does not take account of changes in value of property such as live-stock, produce on hand, tools, and the like. To know his present worth, the farmer must make an inventory of his property, both real and personal. This should be done at the beginning of the farming year when the personal accounts are balanced—usually April 1. A convenient classification of property and one well adapted to use in the double-entry system of accounts is shown below. This is further described on page 224.

TABLE III.—INVENTORY TAKEN APRIL 1, 1907, OF THE PERSONAL PROPERTY OF JOHN DOE.

Teams.

1 gray mare, Nell, 10 years old	$100 00
1 gray horse, Jim, 12 years old	80 00
1 bay driving horse, 7 years old	225 00
1 bay mare, Gip, 10 years old	100 00
2 sets double harness, at $20 and $30	50 00
4 horse pails	1 00
5 blankets	7 00
2 whips	2 00
2 curry combs, 2 brushes	3 00
1 set single harness	40 00
2 tons horse hay at $10 per ton	20 00
Total	$628 00

Live-stock.

3 milch cows, Jan, May and Spot, at $40	$120 00
2 milch cows, Snip and Roan, at $35	70 00
2 yearling heifers, at $15	30 00
1 steer, 2 years old	35 00
1 three-year-old bull	150 00
15 pigs, at $5	75 00
30 chickens, at 40 cents	12 00
Total	$492 00

Farm Tools.

1 self-binder	$125 00
1 mower	80 00
2 plows, at $5 and $8	13 00
1 double harrow	12 00
1 cutaway harrow	13 00
1 grain drill	50 00
1 farm wagon, trees and yoke	75 00
1 light wagon	30 00
1 steel square	75
1 hand saw	1 00
2 spades	1 25
2 round-pointed shovels	1 25
10 grain sacks	2 00
4 hay forks	3 00
2 four-tined forks	1 25
Total	$408 50

Farm products.

420 bushels of wheat on hand, unsold, at 75 cents	$315 00
Total	$315 00

Bills receivable.

Note of James Burroughs on demand without interest	$163 25
Note of John Price of February 14, interest at 6 per cent	376 00
Total	$539 25

Bills payable.

Store bill, C. Bessy	$76 00
Grocery bill, Henry Bell	31 00
Total	$107 00

Cash on hand.

In bank	$350 00
On person	25 00
Total	$375 00

Farm household.

As per detailed statement filed	$625 00
Total	$625 00

Summary.

Teams	$628 00	
Live-stock	492 00	
Farm tools	408 50	
Farm products	315 00	
Bills receivable	539 25	
Cash on hand	375 00	
Farm household	625 00	
		$3,382 75
Less bills payable		107 00
Net personal assets		$3,275 75

Real estate.

Farm, including buildings and other betterments, 100 acres $50 per acre	$5,000 00	
Less mortgage, $1,500, and two months' accrued interest at 5 per cent, April 1, 1907	1,512 50	
Net value in excess of mortgage		$3,487 50
Net personal property		3,275 75
Total net assets April 1, 1907		$6,763 25

An inventory similar to this, carefully and honestly made, will enable the farmer to understand his actual wealth, an item worth knowing. An erroneous idea of the wealth of the family on the part of any of its members is likely to lead either to extravagance or undue economy. It is better to know the facts and to regulate expenditures accordingly. Such an inventory made once a year will enable the farmer to know just what he has gained or lost during the year. The difference between the "total net assets" at the beginning and end of any farming year will show the net gain or loss.

Annual inventories, then, enable the farmer to know definitely his present worth and whether he is gaining or losing in his struggle for a competence. Moreover, well-kept single-entry ledger accounts with all persons with whom he has unfinished transactions, in order that he may meet all obligations, are certainly the very least that any intelligent farmer should attempt.

Double-entry system of accounts.

While the methods of accounting described above furnish the farmer much valuable information concerning his business, they do not supply sufficient details to enable him to make a critical study of the sources of his profits and losses. They do not enable him to eliminate or correct those enterprises that give rise to the latter, and to emphasize or multiply those that yield the former. No commercial or manufacturing enterprise would be expected to succeed if run so blindly that the manager could not tell definitely which departments were paying and which were not. The time has come when the man who would make a financial success of farming must also study his business in detail.

The progressive dairyman has recognized this fact, and for a number of years has been busy with the Babcock machine, disposing of the cows that cut down the profits and building up his herd with superior producers. It is equally important, though less difficult of accomplishment, that the farmer know which of the various enterprises conducted by him are yielding profits and which losses. As stated before, a single-entry ledger account with any given department or crop, will show its degree of profitableness if work records are kept and the labor item is duly charged. If several such accounts are desired, the labor involved in keeping them is so nearly equal to that of double-entry records that the latter might better be employed.

Fundamental principle.—In double-entry bookkeeping, account is taken of the fact that in every transaction two parties are concerned, the one who receives value, the other who parts with value. In Table I, it will be observed that, on April 8, John Jones received $10, and was duly charged with the same. It is evident that the cash account parted with value; therefore, in double-entry accounting, the same $10 would be entered on the credit side of that account. So, in double-entry accounts, every debit has a corresponding credit, and every credit a corresponding debit. The party or department that receives value is debited, while the party or department that parts with value is credited.

On April 5, Jones had five bushels of potatoes at 50 cents per bushel, and the transaction is entered on the debit side of his account. The "Potato-field" should be credited in this case. This is done if a separate account is opened for each crop; or the term "Produce" may be used for a group of crops, of which the potato is one. On April 30, note is made of the fact that Jones has parted with labor to the value of $32.31, and is credited with the same. Ten dollars' worth, say, of his labor was expended on the dairy, $15 on the oat-field, and the remainder on the corn-field. The accounts with these departments, then, should be charged with the various amounts, the sum of which will equal $32.31, the amount credited to Jones. So, for every department or person credited, there is a department or person to be debited. If hay is worth $10 per ton, and the farmer draws 30 tons from the field, the account under "Hay-Field" should be credited:

By 30 tons of hay at $10 . . . . . . $300 00

If 5 tons of this hay are put in the horse-barn for use there, "Teams" should be debited:

To 5 tons hay at $10 . . . . $50 00

If 15 tons are required for the use of the dairy, then "Live-stock" should be debited:

To 15 tons hay at $10 . . . . $150 00

If the balance, 10 tons, are sold for cash, then "Cash" should be debited:

To hay sold, 10 tons at $10 . . . . . $100 00

It will be observed that the sum of the three debits is equal to the one credit. Thus the entries are kept in balance.

Having thus emphasized the fundamental principle underlying double-entry accounting we must, before entering upon an illustration of the same, explain some essential preliminaries.

Work reports.—Mention must be made of work reports. The chief item of cost in the growing of most crops is the labor expended on them. Most farmers do not keep labor records, and at once will object that the work involved in doing so would be too great. Such records certainly require attention and some work, but the amount is not excessive if the work is well systematized and proper blanks provided. Without daily work reports, the farmer cannot tell, at the end of the month, with any accuracy how much labor has been bestowed on the various departments or crops; he cannot debit them correctly; he can never know what their cost has been.

In enterprises that are so large that the superintendent can scarcely know by personal observation the number of hours devoted by the different laborers to the various tasks assigned to them, it may be best to require every laborer to hand in every evening, on slips provided for the purpose, a statement of the number of hours devoted to each kind of work. The data from these slips are then compiled by the accountant in such a manner as to show the total number of hours expended on each kind of work then being performed and are entered on the work sheet. At the end of the month the total time bestowed on each crop or department is ascertained from the work-sheet and charged against it.

If, however, the number of hands employed is not so large but that the superintendent may know from his own observations the number of hours each man devoted to the various departments, then it may be as well for the superintendent alone to be charged with making the work-record.

A familiar and convenient form for keeping work-records is illustrated in Table IV at top of page 220.

Before beginning a month, the Sundays should be starred or crossed off to guard against errors.

It is a small matter for the person in charge to enter, every evening, the number of hours devoted to each kind of work opposite the proper date and under its proper designation. After the sheet is started, no writing is necessary other than to enter these figures in their proper squares. The work of two hired men, Peter Brown and John Smith, and the farmer or farm foreman, John Doe, is supposed to be recorded. These parties are supposed to be regular workers at a stipulated wage either by the day or month. In the last column, the ab-

TABLE IV.—PLEASANT PLACE FARM. WORK-RECORD FOR APRIL, 1907.
Working: P. Brown, J. Smith, J. Doe.

Date	Teams	1907 hay-field	Contingent	Live-stock	Tools	Corn-field	Improvements	1907 wheat	Orchard	1908 wheat	1907 oats	Absent
1	4	16	. .	. .	. .	. .	. .	10	. .	. .	. .	. . . .
2	. .	15	5	. .	. .	. .	. .	. .	. .	. .	5	5 J. D.
3	. .	10	. .	. .	. .	10	. .	. .	. .	. .	10	. . . .
4	. .	10	5	5	. .	. .	. .	. .	. .	. .	10	. . . .
5	. .	5	5	4	1	5	. .	. .	. .	. .	10	. . . .
6	. .	. .	. .	5	. .	15	. .	. .	. .	. .	10	. . . .
* 7	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. . . .
8	. .	. .	. .	. .	. .	10	. .	. .	. .	. .	10	10 J. D.
9	. .	5	. .	. .	. .	10	. .	. .	5	. .	. .	10 J. D.
10	2	. .	. .	6	1	. .	11	10	. .	. .	. .	. . . .
11	. .	. .	. .	. .	. .	10	10	10	. .	. .	. .	. . . .
12	. .	. .	. .	. .	. .	. .	. .	30	. .	. .	. .	. . . .
13	. .	. .	. .	. .	. .	. .	. .	30	. .	. .	. .	. . . .
*14	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. . . .
15	. .	. .	. .	6	2	. .	. .	10	12	. .	. .	. . . .
16	. .	. .	. .	. .	. .	. .	. .	20	10	. .	. .	. . . .
17	. .	. .	5	. .	5	. .	. .	20	. .	. .	. .	. . . .
18	. .	. .	. .	. .	10	. .	. .	20	. .	. .	. .	. . . .
19	. .	. .	. .	. .	. .	11	5	. .	4	. .	10	. . . .
20	. .	10	. .	. .	. .	. .	. .	20	. .	. .	. .	. . . .
*21	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. . . .
22	. .	. .	. .	. .	. .	. .	. .	10	. .	10	10	. . . .
23	. .	10	. .	2	2	. .	. .	. .	5	10	. .	1 J. S.
24	. .	20	. .	. .	. .	. .	. .	. .	. .	10	. .	. . . .
25	. .	20	. .	. .	. .	. .	. .	. .	. .	10	. .	. . . .
26	. .	20	. .	. .	. .	. .	. .	. .	. .	10	. .	. . . .
27	. .	10	. .	. .	. .	. .	10	. .	. .	10	. .	. . . .
*28	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. . . .
29	2	5	14	1	3	. .	. .	. .	. .	. .	. .	5 J. S.
30	. .	4	2	4	3	4	. .	. .	3	. .	. .	10 J. D.
31	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. . . .
Total hours	8	160	36	33	27	75	36	180	39	69	75	
Rate	15c.	15c.	15c.	15c.	15c.	15c.	15c.	15c.	15c.	15c.	15c.	
Amount	$1.20	$24.00	$5.40	$4.95	$4.05	$11.25	$5.40	$27.00	$5.85	$10.35	$11.25	

sences are recorded. The number of hours absent and the initials of the absentee are put down. At the end of the month each man should be credited with full time less the hours absent as shown in this column. At the bottom of the page is shown the total number of hours' labor devoted to each department or crop during the month and the cost at the given rate. If the men board themselves, the sum of these amounts will just equal the sum of the amounts already credited to the workmen. If, however, the men board in the farmer's family, the wages paid them does not represent the total cost of their work. The value of the board should be added to the wages, to find the cost of the labor. Ordinarily, it may be easiest to fix the rate per hour at what is usual in the locality when the laborers do board themselves, and the difference between this rate and the wages actually paid will represent the value of the board. This value being furnished by household should finally be credited to Household.

A similar sheet on which the work done by the teams is recorded in the same way, should be provided. These consolidated work-reports involve somewhat less labor and less expense for paper than is required if separate sheets are used for each laborer and each team. If, however, the men are hired at different rates and it is desired to charge the labor to the several departments at actual cost, some difficulty may be experienced in using them. In this case, the total number of hours worked by all the men during the month may be divided into the total earnings of all (plus cost of board furnished, if any) to find the actual average cost per hour, and this used in computing cost of labor bestowed upon the several crops.

A more usual form of work-sheet is shown in Tables V to IX. It is adapted to recording each man's and each team's labor separately. If the wages of the men vary; if it is desired to use the labor sheets as the basis of paying the men, that is, if they are to be paid only for actual work; if it is desired to have a record as to where each man's labor is bestowed, then the separate work-sheets are to be preferred. The following are sheets for three men and two teams. The data given on them will be used later in illustrating the posting of work-reports:

TABLE V.—PLEASANT PLACE FARM. WORK-REPORT OF PETER BROWN FOR APRIL, 1907.

No. 1	1	2	3	4	5	6	•7	8	9	10	11	12	13	•14	15	16	17	18	19	20	•21	22	23	24	25	26	27	•28	29	30	31	No. of hours	Price per hour	Total
Hay-field	8	10	10	5	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	33	15 cts.	$4 95
Teams	2	..	..	..	..	..	..	..	..	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	..	..	4	15 cts.	60
Contingent	..	..	..	5	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	5	2	..	12	15 cts.	1 80
Live-stock	..	..	..	..	4	..	..	..	..	3	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	..	..	8	15 cts.	1 20
Tools	..	..	..	..	1	..	..	..	..	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	3	1	..	6	15 cts.	90
Corn-field	..	..	..	..	5	10	..	10	10	..	10	..	..	..	..	..	..	..	3	..	..	..	..	..	..	..	..	..	..	4	..	52	15 cts.	7 80
Improvements . . .	..	..	..	..	..	..	..	..	..	5	..	..	..	..	..	..	..	..	5	..	..	..	..	..	..	..	..	..	..	..	..	10	15 cts.	1 50
1907 wheat-field . .	..	..	..	..	..	..	..	..	..	..	..	10	10	..	10	10	10	10	..	10	..	..	..	..	..	..	..	..	..	..	..	70	15 cts.	10 50
Orchard	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	2	..	..	..	..	..	..	..	..	..	..	3	..	5	15 cts.	75
1908 wheat-field . .	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	10	10	10	10	10	10	..	..	..	..	60	15 cts.	9 00
																																260×	15c. =	$39 00

TABLE VI.—PLEASANT PLACE FARM. WORK-REPORT OF BAY TEAM (BROWN'S), FOR APRIL, 1907.

No. 2	1	2	3	4	5	6	•7	8	9	10	11	12	13	•14	15	16	17	18	19	20	•21	22	23	24	25	26	27	•28	29	30	31	No. of hours	Price per hour	Total
					a	a													a	a		a	a											
Hay-field	8	10	10	5	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	5	..	..	..	..	..	..	..	..	38	20 cts.	$7 60
Teams	2	..	..	..	..	..	..	..	..	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	3	20 cts.	60
Contingent	..	..	..	5	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	5	20 cts.	1 00
Live-stock	..	..	..	..	1	..	..	..	..	3	..	..	..	..	..	..	..	..	..	3	..	..	..	..	..	..	..	..	..	..	..	7	20 cts.	1 40
Tools	..	..	..	..	5	..	..	..	..	..	10	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	15	20 cts.	3 00
Corn-field	..	..	..	..	..	..	..	10	10	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	21	20 cts.	4 20
Improvements . . .	..	..	..	..	..	..	..	..	..	5	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	10	..	..	..	..	15	20 cts.	3 00
1907 wheat-field . .	..	..	..	..	..	..	..	..	..	..	..	10	10	..	10	10	10	10	..	..	..	..	..	10	10	10	..	..	..	..	..	90	20 cts.	18 00
Oat-field	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	10	10	..	20	20 cts.	4 00
																																214×	20c. =	$42 80

TABLE VII.—PLEASANT PLACE FARM. WORK-REPORT OF JOHN SMITH, FOR APRIL, 1807.

No. 3	1	2	3	4	5	6	•7	8	9	10	11	12	13	•14	15	16	17	18	19	20	•21	22	23	24	25	26	27	•28	29	30	31	No. of hours	Price per hour	Total
1907 wheat-field . .	10	..	..	..	..	..	..	..	..	10	10	10	10	..	..	10	10	10	..	..	..	..	..	..	..	..	..	..	..	..	..	80	15 cts.	$12 00
Oat-field	..	5	10	10	10	10	..	10	..	..	..	..	..	..	..	..	..	..	10	..	..	10	..	..	..	..	..	..	..	..	..	75	15 cts.	11 25
Hay-field	..	5	..	..	..	..	..	..	5	..	..	..	..	..	..	..	..	..	..	10	..	..	a	10	10	10	10	..	5	4	..	69	15 cts.	10 35
Orchard	..	..	..	..	..	..	..	..	5	..	..	..	..	..	2	..	..	..	..	..	..	..	5	..	..	..	..	..	a	..	..	12	15 cts.	1 80
Live-stock	..	..	..	..	..	..	..	..	..	..	..	..	..	..	6	..	..	..	..	..	..	..	2	..	..	..	..	..	..	4	..	12	15 cts.	1 80
Tools	..	..	..	..	..	..	..	..	..	..	..	..	..	..	2	..	..	..	..	..	..	..	2	..	..	..	..	..	..	2	..	6	15 cts.	90
																																254×	15c. =	$38 10

TABLE VIII.—PLEASANT PLACE FARM. WORK-REPORT OF GRAY TEAM (SMITH'S), FOR APRIL, 1907.

No. 4	1	2	3	4	5	6	• 7	8	9	10	11	12	13	• 14	15	16	17	18	19	20	• 21	22	23	24	25	26	27	• 28	29	30	31	No. of hours	Price per hour	Total
1907 wheat-field	10	..	..	..	..	..	..	..	..	..	..	..	..	..	..	10	10	10	..	..	..	..	..	10	10	10	10	..	..	..	..	80	20 cts.	$16 00
Oat-field	..	5	10	10	10	10	..	10	a	10	10	10	10	..	a	..	..	..	10	..	..	10	..	..	..	..	..	..	a	a	..	115	20 cts.	23 00
Hay-field	..	5	..	..	..	..	..	..	5	..	..	..	..	..	..	..	..	..	..	10	..	..	a	..	..	..	..	..	5	4	..	29	20 cts.	5 80
																																224×	20c. =	$44 80

TABLE IX.—PLEASANT PLACE FARM. WORK-REPORT OF JOHN DOE (FARMER), FOR APRIL, 1907.

No. 5	1	2	3	4	5	6	• 7	8	9	10	11	12	13	• 14	15	16	17	18	19	20	• 21	22	23	24	25	26	27	• 28	29	30	31	No. of hours	Price per hour	Total
Teams	2	..	..	..	..	..	..	a	a	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	..	..	4	15 cts.	$0 60
Hay-field	8	..	..	10	5	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	10	10	10	10	10	..	..	..	..	73	15 cts.	10 95
Contingent	..	5	..	..	5	..	..	..	..	..	..	..	..	..	..	..	5	..	..	..	..	..	..	..	..	..	..	..	9	a	..	24	15 cts.	3 60
Live-stock	..	a	..	..	..	5	..	..	..	3	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	8	15 cts.	1 20
Tools	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	5	10	..	..	..	..	..	..	..	..	..	..	..	..	..	15	15 cts.	2 25
Corn-field	..	..	10	..	..	5	..	..	..	..	..	..	..	..	..	..	..	..	8	..	..	..	..	..	..	..	..	..	..	..	..	23	15 cts.	3 45
Improvements	..	..	..	..	..	..	..	..	..	6	10	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	16	15 cts.	2 40
1907 wheat-field	..	..	..	..	..	..	..	..	..	..	..	10	10	..	..	..	..	..	..	10	..	10	..	..	..	..	..	..	..	..	..	40	15 cts.	6 00
Orchard	..	..	..	..	..	..	..	..	..	..	..	..	..	..	10	10	..	..	2	..	..	..	..	..	..	..	..	..	..	..	..	22	15 cts.	3 30
																																225×	15c. =	$33 75

These data may be summarized on one sheet before posting, if desired, and thus materially reduce the number of entries to be made in the ledger. Such summary of the five labor sheets is here illustrated:

TABLE X.—SUMMARY OF WORK FOR APRIL, 1907.

Work of men.

	Total number hours	Total cost
Hay-field	175	$26 25
Teams	8	1 20
Contingent	36	5 40
Live-stock	30	4 50
Tools	27	4 05
Corn-field	75	11 25
Improvements	26	3 90
1907 wheat-field	190	28 50
1908 wheat-field	60	9 00
Oat-field	75	11 25
Orchard	39	5 85

Work of teams.

	Total number hours	Total cost
Hay-field	67	$13 40
Teams	3	60
Contingent	5	1 00
Live-stock	7	1 40
Tools	15	3 00
Corn-field	21	4 20
Improvements	15	3 00
1907 wheat-field	170	34 00

The blotter, or day-book.—All transactions should be recorded in the blotter, or day-book, in the order in which they occur. The day-book, being the book of original entry, is the one that must be presented in the court-room in case of legal contest. It is important, therefore, that it should relate all necessary details for a full understanding of every transaction. It should give the date of every transaction, the person or department receiving value, the person or department parting with value, the amount of the commodity, the price, and the total value.

This does not mean that there is need of much writing. The account to be debited is always written or indicated at the left of the page, under Dr., the account to be credited at the right of the page, under Cr. Thus, the first transaction in the day-book signifies that Peter Brown has received six bushels of apples, valued at 50 cents per bushel, and, as he does not at the time pay for them, he is to be debited to their value, $3, while the Orchard has parted with the same and, therefore, is to be credited by a like amount. Every item in the day-book that follows may be interpreted in the same manner. In actual practice, however, the reverse of this order would be what actually occurs. The accountant has in mind the facts of the transaction, and translates them into the abbreviated language of the day-book:

TABLE XI.—DAY-BOOK OR BLOTTER—1907.

Dr.	Cr.	
April 1		
Peter Brown 6 bushels of apples, at 50 cents.	Orchard	$3 00
April 2		
Teams (1) Shoeing bill (at LaPoint's)	Cash	8 25
April 3		
Contingent (2) Expenses at Rochester	Cash	6 75
April 4		
John Smith 10 bushels of wheat, 60 cents	Farm products (3)	6 00
April 5		
Improvements Building 40 rods fence, at 12½ cents	John Bryant	5 00
April 6		
John Bryant 60 bushels of wheat, at 70 cents.	Farm products	42 00
Live-stock 1 yearling heifer	J. Smith	20 00
April 8		
John Bryant Gray horse Jim	Teams	60 00
Cash Note of John Price paid	Bills receivable (4)	376 00
Interest		2 40
		$378 40
Cash 13½ bushels apples, at 40 cents (John Rice)	Orchard	$5 40
1907 wheat-field 15 bushels of seed spring wheat, at $1 per bushel	Cash	15 00
John Bryant 14 bushels of apples, at 20 cents.	Orchard	2 80
April 9		
Peter Brown Cash	Cash	10 00
Tools Repairs on reaper (by Martins).	Cash	4 29
Teams Paid Wall & Co., repair harness.	Cash	3 58
April 10		
Improvements Building 30 rods fence, at 15 cents	John Bryant	4 50
Live-stock 100 bushels corn, at 50 cents	Corn-field	50 00
5 tons stalks, at $3		15 00
		$65 00
Cash Received for milk	Live-stock	$42 36
Teams 5 tons of hay, at $8	Hay-field	40 00
April 11		
Live-stock 4 tons clover hay, at $7	Hay-field (5)	$28 00
Cash 2 colts (sold to Bush)	Teams	96 00
Bills payable (4) Grocery bill paid (Henry Bell)	Cash	31 00
Store bill paid (C. Bessy)		76 00
		$107 00
Cash Bay horse (sold to Jones)	Teams	$160 00
John Smith Cash	Cash	20 00
April 15		
1907 wheat-field Threshing bill, 300 bushels, at 5 cents	Cash	15 00
Paid John Buck, 2 days' threshing		4 00
Paid Buck, use of team		2 00
		$21 00
Cash Received for eggs	Live-stock (6)	$21 50
Teams 5 tons of hay, at $8	Hay-field	40 00
Teams 100 bushels oats, at 30 cents	Oat-field	30 00
April 18		
Cash 310 bushels wheat, at 75 cents	Farm products (7)	232 50
Cash 300 bushels wheat, at 80 cents	1907 wheat-field (8)	240 00
Cash John Burroughs, paid note	Bills receivable	163 25
Tools Paint and repair of carriage, B. Rich	Cash	21 00
Repair of harrow and plow		8 00
		$29 00
April 22		
Improvements (9) Cutting 10 cords of wood, at 75 cents	John Bryant	$7 50
Cash 10 cords of wood, at $3 per cord, sold to J. Bent	Improvements	30 00
John Doe (10) Cash	Cash	33 75
1908 wheat-field 6 days, man and team, P. Handy, $2.50 a day	Cash	15 00
April 25		
Orchard Two days, picking fruit, D. Hill.	Cash	3 00
Peter Brown 2 bushels peaches	Orchard	2 00
½ bushel cherries		50
		$2 50
1908 wheat-field 30 bushels seed wheat, at 80 cents	Farm products	$24 00
Teams Span of three-year-old fillies	Cash	275 00

April 30

Peter Brown	Cash	Cash	$17 00
Cash	Orchard	96 barrels apples, at $1.25	120 00
Cash	Corn-field	60 bushels corn, at 40 cents	24 00
Cash	Live-stock	200 quarts cream, at 35 cents	70 00
1907 wheat-field	Tools (11)	Use of tools	10 00
1908 wheat-field	Tools	Use of tools	8 00
Teams	Tools	Use of tools	6 00
Oat-field	Tools	Use of tools	8 00
Corn-field	Tools	Use of tools	9 00
Live-stock	Tools	Use of tools	3 79
Hay-field	Tools	Use of tools	7 00

The items given in the day-book are intended to illustrate the various kinds of transactions one is likely to meet with in farm accounting. Some of these need explanation.

Notes. (1) La Point's bill was paid when presented. As Teams receive value they are debited to the amount, and as Cash parted with value it is credited. La Point's name is introduced simply to show where the work was done, and the data might prove valuable if the receipted bill should be lost and a duplicate presented for payment.

(2) There will be occasional items that belong to the business as a whole, but cannot be charged to any particular department. These may properly be carried as Contingent Expenses.

(3) When the inventory is taken, all products, such as wheat, hay and oats, are charged to "Farm Products" account. Such products, however, as have already been charged to Teams or Live-stock are excepted and, instead, are inventoried with Teams or Live-stock, as the case may be.

(4) At the time of making the annual inventory, the farmer should bring together all bills, notes, and accrued interest to date, closed book accounts, and other evidences of his indebtedness (except the mortgage on the farm, if there be one) under the head of "Bills Payable." Similar evidences of other persons' indebtedness to him should be assembled under the head of "Bills Receivable."

(5) When the teams and other classes of live-stock with which separate accounts are kept are so located in the buildings that their supply of hay and food materials are stored separately, these materials should be charged to them as they come from the fields. If, however, such food-stuffs are stored in one place, and several classes of live-stock are fed from them, it becomes necessary, by means of occasional weighings and estimates, to determine approximately the amount used by each class during the season.

(6) In this article, all animals except teams are classed under the head of live-stock. In practice, they may be subdivided under the heads, "Dairy," "Sheep," "Swine," "Poultry," and the like.

(7) Crops that have been inventoried to "Farm Products" may vary in price or measure from the inventory estimate. Hence, the Farm Products account may show either a gain or a loss.

(8) Crops sold at or soon after harvest time, will best be credited directly to the field, and not charged to farm products at all.

(9) If, in the clearing of the brush lot, a small quantity of wood is produced, the cutting may be debited to "Improvements" and the wood, when sold, credited to the same account.

(10) John Doe is supposed to be a proprietor who works. His work should, therefore, be charged to the various departments as shown on the work reports. This item is introduced here in order to balance John Doe's account in the ledger. If, however, he does not actually take the money away from his other funds, the account with cash will be "long" by this amount. In practice, it may be better not to open any ledger account with John Doe, but let him receive pay for his labor in larger net profits at the end of the year.

(11) The last seven items that are here credited to "Tools" cannot be determined till the end of the year, when the actual amount needed to balance the tools account, so as to show neither gain nor loss (in this case $51.79, which is depreciation due to wear), is ascertained from the ledger account and distributed among the crops having the benefit of tools according to the farmer's judgment.

TABLE XII.—SUMMARY OF INVENTORY. TAKEN APRIL 1, 1908, OF THE PERSONAL EFFECTS OF JOHN DOE.

Teams	$810 00
Live-stock	570 00
Farm tools	396 00
Cash	1,389 69
Value of wheat in ground (1908 wheat-field)	*54 50
Accounts due (Bryant)	*87 80
Farm household	625 00
	$3,932 99
Accounts owing (Smith)	*$25 75
Net assets, April 1, 1908	$3,907 24
Net assets, April 1, 1907	3,275 75
Gain	$631 49

*These amounts are ascertained from the ledger accounts at the end of the year.

The ledger.—Interspersed through the preceding pages under the headings of *Inventory*, *Work-sheets* and *Day-book*, we have representative data relating to a farmer's affairs and transactions. It is not, however, arranged in such order that the farmer can conveniently get at all the facts relating to any departmental or personal account or to his business as a whole. To be sure, he could run through the work-sheets and day-book and pick out the items that relate to any given account, Peter Brown's for instance, and effect a settlement with him. It would, however, be at the expense of considerable time and labor. To make this data available for use, it must be sorted and systematically arranged; that is to say, all items belonging to each account should be brought together. The book in which this is done is the ledger and the process is called "posting."

The double-entry ledger, like the single-entry ledger, may consist of either one or two pages for each account, or a single large page may be ruled to resemble the usual two-page ledger.

The ledger accounts that follow include the data already given. There are certain steps in posting to which attention should be called. In all accounts in which are the teams, cash, or anything else that has an inventory value, the inventory should be first entered on the debit side because it represents the amount of wealth that the farmer has invested in that branch of his business. He will debit the account with everything that goes into it and credit it with everything he gets from it—including its inventory value at the end of the year.

Inventory values, however, representing what the farmer owes, such as bills payable or the credit balances from personal accounts, should be entered on the credit side of their respective accounts. The inventories should be entered in red ink to distinguish them from the ordinary transactions, and the amount placed in the right of the pair of columns. The other items being placed in the left column are in position to be totaled conveniently in making the trial balance, which is to be explained later. In entering items in the ledger, very little or no descriptive matter is needed, although a mark should always be given showing where the item comes from as "B 2" for blotter, page 2 or "W 3" for work report, No. 3.

Attention is called to the fact that every item in the day-book is placed on the debit side of the account named at the left and in the credit side of the account named at the right of the blotter entry. The work-reports not being completed till the end of the month, the labor items would naturally be posted at this time.

The several accounts will be debited to the amounts given opposite them in the various work-reports or in the summary, if one is made, while the laborer and teams will be credited with labor which will equal the totals of the smaller items:

TABLE XIII*.

1907	Cash	Dr.		1907	Cash	Cr	
	Inventory		**$375 00**	April 3	By expenses	$8 25	
April 8	To Price note paid . B1	$376 00		" 2	By shoeing	6 75	
	Interest on same . .	2 40		" 8	By seed-wheat	15 00	
" 8	To apples (Rice) . . . 1	5 40		" 9	By paid Brown . . .	10 00	
" 10	To milk 2	42 36		" 9	By repairs on mower .	4 29	
" 11	To two colts (Buck) . 2	96 00		" 9	By repairs on harness .	3 68	
" 11	To bay horse 2	160 00		" 11	By paid Bell	31 00	
" 15	To eggs 2	21 50		" 11	By paid Bessy	76 00	
" 18	To wheat 2	232 50		" 11	By paid Smith	20 00	
" 18	To wheat 2	240 00		" 15	By threshing	15 00	
" 18	To note paid (Burrough's)	163 25		" 15	By threshing, Buck . .	4 00	
" 22	To wood	30 00		" 15	By threshing, team . .	2 00	
" 30	To apples	120 00		" 18	By repairs	21 00	
" 30	To corn	24 00		" 18	By repairs	8 00	
" 30	To cream.	70 00		" 22	By paid Doe	33 75	
			1,583 41	" 22	By paid Handy	15 00	
				" 25	By paid Hill	3 00	
				" 25	By fillies	275 00	
				" 30	By paid Brown	17 00	
							$568 72
					By inventory		**1,389 69**
			$1,958 41				$1,958 41

TABLE XIV.

1907	Teams	Dr.		1907	Teams	Cr.	
April 1	**To inventory . . . . .**		**$628 00**				
" 2	To shoeing	$8 25		April 8	By horse, sold	$60 00	
" 9	To repairing harness . . .	3 68		" 11	By colts, sold	96 00	
" 10	To hay	40 00		" 11	By horse, sold	160 00	
" 15	To hay	40 00		" 30	By labor . . . . . . w 2	32 10	
" 15	To oats	30 00		" 30	By labor . . . . . . w 4	33 60	
" 25	To pair fillies	275 00					$381 70
" 30	To use of tools	6 00					
" 30	To work . . . . w 1	50					
" 30	To work . . . . w 2	45					
" 30	To work . . . . w 5	60					
			404 48				
	To balance (gain) . . .		**159 22**		**By inventory . . . . .**		**810 00**
			$1,191 70				$1,191 70

*Black-faced type indicates red-ink entries.

TABLE XIV, continued

1907	Live-stock	Dr.		1907	Live-stock	Cr.	
April 1	**To inventory**		**$492 00**				
" 6	To one yearling	$20 00		Apr.10	By milk, sold	$42 36	
" 10	To corn	50 00		" 15	By eggs, sold	21 50	
" 10	To stover	15 00		" 30	By cream, sold	70 00	
" 11	To clover hay	28 00					$133 86
" 30	To work . . . w 1	1 00					
" 30	To work . . . w 2	1 05					
" 30	To work . . . w 3	1 50					
" 30	To work . . . w 5	1 20					
" 30	To use of tools	3 79					
			121 54				
	To balance (gain)		**90 32**		**By inventory**		**570 00**
			$703 86				$703 86

1907	Farm tools	Dr.		1907	Farm tools	Cr.	
April 1	**To inventory**		**$408 50**				
" 9	To repairs	$4 29		Apr.30	By use 1907 wheat	$10 00	
" 18	To repair carriage	21 00		" 30	By use 1908 wheat	8 00	
" 18	To repair plow, harrow	8 00		" 30	By use teams	6 00	
" 30	To work . . . w 1	75		" 30	By use oats	8 00	
" 30	To work . . . w 2	2 25		" 30	By use corn	9 00	
" 30	To work . . . w 3	75		" 30	By use live-stock	3 79	
" 30	To work . . . w 5	2 25		" 30	By use hay-field	7 00	
			39 29				$51 79
					By inventory		**396 00**
			$447 79				$447 79

TABLE XV.

1907	Farm products	Dr.		1907	Farm products	Cr.	
April 1	**To inventory**		**$315 00**	April 4	By wheat, sold	$6 00	
				" 6	By wheat, sold	42 00	
				" 18	By wheat, sold	232 50	
				" 25	By wheat, sold	24 00	
							$304 50
					By balance (loss)		**10 50**
			$315 00				$315 00

1907	Bills receivable	Dr.		1907	Bills receivable	Cr.	
April 1	**To inventory**		**$539 25**	April 8	By Price note paid	$376 00	
" 1	**To balance (gain)**		**2 40**	" 8	By interest on same	2 40	
				" 18	By rec'd Burrough's note	163 25	
							$541 65
			$541 65				$541 65

	Bills payable	Dr.			Bills payable	Cr.	
Apr.11	To grocery bill, paid	$31 00		April 1	**By inventory**		**$107 00**
" 11	To store bill, paid	76 00					
			$107 00				
			$107 00				$107 00

	Farm household	Dr.			Farm household	Cr.	
April 1	**To inventory**		**$625 00**	Apr.30	**By inventory**		**$625 00**

TABLE XVI.

1907	Contingent	Dr.		1907	Contingent	Cr.	
April 3	To expense to Rochester .	$6 75					
" 30	To labor . . . . w 1	1 50					
" 30	To labor . . . . w 2	75					
" 30	To labor . . . . w 5	3 60					
			$12 60		**By balance (loss)** . .		**$12 60**
			$12 60				$12 60

1907	Improvements	Dr.		1907	Improvements	Cr.	
April 5	To fence (Bryant)	$5 00		Apr.22	By wood sold	$30 00	
" 10	To fence (Bryant)	4 50					$30 00
" 22	To cutting wood	7 50					
" 30	To labor . . . . w 1	1 25					
" 30	To labor (team) . . . w 2	2 25					
" 30	To labor . . . . w 5	2 40					
			$22 90				
	To balance (gain) . . .		**7 10**				
			$30 00				$30 00

1907	Orchard	Dr.		1907	Orchard	Cr.	
Apr.25	To labor (Hill)	$3 00		April 1	By apples sold	$3 00	
" 30	To labor . . . . w 1	63		" 8	By apples sold	5 40	
" 30	To labor . . . . w 3	1 50		" 8	By apples sold	2 80	
" 30	To labor . . . . w 5	3 50		" 25	By peaches sold	2 00	
			$8 43	" 25	By cherries sold	50	
				" 30	By apples sold	120 00	
	To balance (gain) . . .		**125 27**				$133 70
			$133 70				$133 70

TABLE XVII.

1907	Wheat, 1907	Dr.		1907	Wheat, 1907	Cr.	
April 8	To seed	$15 00		Apr.18	By wheat, sold	$240 00	
" 8	To threshing	15 00					$240 00
" 15	To labor (Bush)	6 00					
" 30	To labor . . . . w 1	8 75					
" 30	To labor . . . . w 2	13 50					
" 30	To labor . . . . w 3	10 00					
" 30	To labor . . . . w 4	12 00					
" 30	To labor . . . . w 5	6 00					
" 30	To use of tools	10 00					
			$96 25				
	To balance (gain) . . .		**143 75**				
			$240 00				$240 00

1907	Wheat, 1908	Dr.		1907	Wheat, 1908	Cr.	
Apr.22	To labor	$15 00					
" 25	To seed	24 00					
" 30	To labor . . . . w 1	7 50					
" 30	To use of tools	8 00					
			$54 50				
				Apr.30	**By balance (to new inv.)**		**$54 50**
			$54 50				$54 50

TABLE XVII, continued.

1907	Corn	Dr.		1907	Corn	Cr.	
Apr.30	To labor . . . . w 1	$6 50		Apr.10	By corn, sold	$50 00	
" 30	To labor . . . . w 2	3 15		" 10	By stalks	15 00	
" 30	To labor . . . . w 5	3 45		" 30	By corn, sold	24 00	
" 30	To use of tools	9 00					$89 00
			$22 10				
	To balance (gain) . . .		66 90				
			$89 00				$89 00

TABLE XVIII.

1907	Oats	Dr.		1907	Oats	Cr.	
Apr.30	To labor . . . . w 2	$3 00		Apr.15	By 100 bushels oats . .	$30 00	
" 30	To labor . . . . w 3	9 38					$30 00
" 30	To labor . . . . w 4	17 25					
" 30	To use of tools	8 00					
			$37 63				
					By balance		7 63
			$37 63				$37 63

1907	Hay	Dr.		1907	Hay	Cr.	
Apr.30	To labor . . . . w 1	$4 12		Apr.10	By hay	$40 00	
" 30	To labor . . . . w 2	5 70		" 11	By hay	28 00	
" 30	To labor . . . w 3	8 62		" 15	By hay	40 00	
" 30	To labor . . . . w 4	4 35					$108 00
" 30	To labor . . . . w 5	10 95					
" 30	To use of tools	7 00					
			$40 74				
	To balance (gain) . . .		67 26				
			$108 00				$108 00

TABLE XIX.

1907	Peter Brown	Dr.		1907	Peter Brown	Cr.	
April 1	To apples	$3 00		Apr.30	By labor	$32 50	
" 9	To cash	10 00					$32 50
" 25	To peaches	2 00					
" 25	To cherries	50					
" 30	To cash	17 00					
			$32 50				
			$32 50				$32 50

1907	John Smith	Dr.		1907	John Smith	Cr.	
April 4	To wheat	$6 00		April 6	By heifer	$20 00	
" 11	To cash	20 00		" 30	By labor	31 75	
			$26 00				$51 75
	To balance (to new acct.)		25 75				
			$51 75				$51 75
					By balance from old acct.		$25 75

TABLE XIX, continued.

John Bryant

1907		Dr.		1907		Cr.	
April 6	To wheat	$42 00		April 5	By building fence	$5 00	
" 8	To horse	60 00		" 10	By building fence	4 50	
" 8	To apples	2 80		" 22	By cutting wood	7 50	
			$104 80				$17 00
					To balance (to new acct.)		**87 80**
			$104 80				$104 80
	To bal. (from new acct.)		**$87 80**				

John Doe

1907		Dr.		1907		Cr.	
Apr. 30	To cash	$33 75		Apr. 30	By labor . . . . . w 5	$33 75	
			$33 75				$33 75
			$33 75				$33 75

The trial balance.—It is of the highest importance that accounts be correct. To guard against possible errors, a "trial balance" is taken before the closing of the individual accounts is begun. It will be noted that the amount of every transaction has been entered on the debit side of some account and on the credit side of some other account. So, if the work has been accurately done, the sum of the debits must be exactly equal to the sum of the credits. In preparing for the trial balance, take each account in turn and find the sum of the debit items and also of the credit items, always exclusive of inventory amounts. Set these down in light pencil marks, each in its own column. When all are ready, on a separate sheet or page make a list of the accounts, and in one column set all the debits and in another all the credits. If the work has been correctly done, the sum of the debits will equal the sum of the credits. If it does not, look for the error:

TABLE XX.—TRIAL BALANCE.

	Dr.	Cr.
Cash	$1,583 40	$568 72
Teams	404 48	381 70
Live-stock	121 54	133 86
Farm tools	39 29	51 79
Farm products	. . . .	304 50
Bills receivable	. . . .	541 65
Bills payable	107 00	
Contingent	12 60	
Improvements	22 90	30 00
Orchard	8 43	133 70
Wheat, 1907	96 25	240 00
Wheat, 1908	54 50	
Corn	22 10	89 00
Oats	37 63	30 00
Hay	40 74	108 00
Peter Brown	32 50	32 50
John Smith	26 00	51 75
John Bryant	104 00	17 00
John Doe	33 75	33 75
	$2,747 92	$2,747 92

Balancing accounts.—After a correct trial balance has been secured, the several accounts are ready to be "balanced." To balance an account, find the difference between the sums of the debit and credit sides of the account, and enter this difference on the smaller side so as to make the two equal or "balanced." Personal accounts may be balanced at any desired time, and should surely be balanced at the end of each year. Property accounts cannot well be balanced till a new inventory is taken, which should be done at the end of the year. On page 224 is given a summary of an inventory supposed to be taken one year later than the one used in opening the accounts. In these accounts, data that might have been scattered throughout the year are condensed into one month for the sake of brevity. The sums that have been written in light pencil marks in the left columns should now be written in ink in the right columns. The various values given in the summary of the new inventory should be entered on the credit side of the several accounts. This entry should be in red ink, and the amount carried into the right column. Sum up the debit and credit sides of the account, setting the figures down on a separate sheet of paper. Find the difference between the two sides of the account, and set this difference in the smaller side, preceded by "To balance" if on the debit side, and "By balance" if on the credit side. This entry also should be in red ink to distinguish it from ordinary transactions. Then, the totals of the sides which are equal are brought down, and under them are drawn two red lines to show that the account has been balanced. In this article, the matter that should appear in red ink in an account is printed in full-faced type.

The gain-and-loss statement.—After each of the several accounts has been balanced as described above, the gain-and-loss statement should be made. This is done by assembling the balances that are found on the debit side of the several accounts in the credit side of the gain-and-loss statement, and those balances found on the credit side of the several accounts in the debit side of the statement. In other words, balances on the debit sides of accounts represent profits, and balances on the credit sides of accounts represent losses.

Personal accounts, however, though showing balances, do not contribute to the gain or loss. John Bryant's account shows a balance on the credit side, but it is not loss, as the farmer expects him to pay it some day. It goes into the inventory under accounts receivable, and in opening the new account with Bryant is entered on the debit side "To balance from old account." So, also, John Smith's account shows a balance on the debit side, but this is not gain, since the farmer must pay it some day. It goes into the inventory as bills payable, and in opening Smith's new account will be entered to his credit thus: "By balance from old account."

The wheat-field that is not yet mature has no credits, but the balance does not represent loss, as the harvest is yet to come. The balance goes into the inventory as "wheat in ground," and in opening the new set of accounts is entered on the debit side. The field is supposed to be worth what it has cost. Bills receivable may show a gain, resulting from interest collected. This is better than that the farmer should open an interest account. Farm products may show a gain or loss, depending on whether they were valued at the beginning at more or less than they finally brought. The difference between the sum of the gains and the sum of the losses will be the "net gain." The net gain found in this way should be the same as that found by the inventory method. In connection with the first inventory, there is illustrated a method by which real estate may be taken into the account in order to show "total net worth." This statement may be made yearly, if desired, or, if real estate remains constant, only the personal assets need be considered.

TABLE XXI.—GAIN-AND-LOSS.

	Dr.	Cr.
	(Losses)	(Gains)
Teams	. . .	$159 22
Live-stock	. . .	90 32
Farm products	$10 50	
Bills receivable (interest)	. . .	2 40
Orchard	. . .	125 27
Contingent	12 60	
Improvements	. . .	7 10
Wheat, 1907	. . .	143 75
Corn	. . .	66 90
Oats	7 63	
Hay	. . .	67 26
Balance (net gain)	**631 49**	
	$662 22	$662 22

Short method of accounting.

The system of posting from a day-book or blotter into a ledger, described in the preceding pages, is the usual one. It has, however, two rather serious drawbacks. It requires three times writing of the transaction—once in day-book and twice in ledger. Farmers, more than most classes of people of equal education, are averse to much writing. Numerous efforts have been made to devise a system that will give the same results as double-entry accounts and still necessitate but one writing. Heretofore, these efforts have failed of their purpose.

Another objection to the system already described is the tendency for a large number of items to accumulate on the day-book awaiting posting to the ledger. This is where the system fails with many farmers. During the busy season, the day-book entries will accumulate until at last the task of posting is so great that the farmer has little courage to attack it. To avoid these difficulties, the writer has devised a scheme that will be briefly described. This plan requires the writing of the transaction but once and only the figures representing the amount of the item twice, yet it secures the same result in all respects as the triple-entry system. It requires books of special ruling and construction but not unduly expensive. The plan has not been put to a thorough practical test as yet, having been but recently conceived, but it has been so favorably commented upon by those who should be able to judge of its merits that it is thought well to explain.

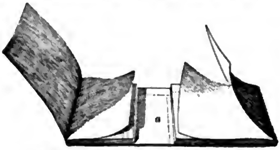
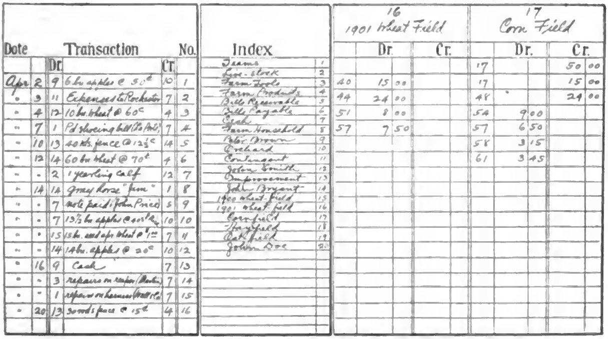


Fig. 64. The short-cut ledger. See Fig. 65.

The short-cut ledger.—The book (Fig. 64) consists, really, of two books united into one. The back cover of what corresponds to the day-book is joined to and is continuous with the front cover of the ledger. This cover is of such length that when both books are closed the edges of the leaves are three or four inches apart. This space (*a*) is occupied by an index of the ledger accounts—giving the page of each. The day-book part may well have pages about five inches wide and should provide spaces as follows: at the left the usual column for dates, then a check column that will take two figures, then a wide space of three or four inches and finally another check space for two figures at the right.

The ledger pages are divided into spaces of two and one-half to three inches. Each such space is ruled thus: a column for reference figures at the left, then dollars and cents space for debits and the same for credits. The pages should be of such size as to take two, three, or four such sets of columns.

In preparing the book for use, one or more columns may be assigned to accounts likely to have few entries and one or more pages to accounts likely to have more. It is better if the ledger be not paged in the making and that the several accounts be numbered by hand instead. As a farmer will usually have only from twenty to forty ledger accounts, this is not a difficult task. The ledger accounts should be plainly named and numbered as | 1 Cash | 2 Teams, | etc., agreeing with the index.



Date		Dr.	Transaction	Cr.	No.
Apr	2	9	6 bu. apples @ 50c	10	1
"	3	11	Expenses to Rochester	7	2
"	4	12	10 bu. wheat @ 60c	4	3
"	7	1	Pd shoeing bill (La Pointe)	7	4
"	10	13	40 rds. fence @ 12½c	14	5
"	12	14	60 bu. wheat @ 70c	4	6
"	"	2	1 yearling calf	12	7
"	14	14	Gray horse "Jim"	1	8
"	"	7	note paid John Price	5	9
"	"	7	13½ bu. apples @ 40c	10	10
"	"	15	15 bu. seed spr. wheat @ $1.00	7	11
"	"	14	14 bu. apples @ 20c	10	12
"	16	9	Cash	7	13
"	"	3	repairs on reaper (Martin)	7	14
"	"	1	repairs on harness (Wall & Co.)	7	15
"	20	13	30 rods fence @ 15c	4	16

Index	
Teams	1
Live-stock	2
Farm Tools	3
Farm Products	4
Bills Receivable	5
Bills Payable	6
Cash	7
Farm Household	8
Peter Brown	9
Orchard	10
Contingent	11
John Smith	12
Improvement	13
John Bryant	14
1900 wheat-field	15
1901 wheat field	16
Corn field	17
Hay field	18
Oat field	19
John Doe	20

16 1901 Wheat Field			17 Corn Field		
	Dr.	Cr.		Dr.	Cr.
			17		50 00
40	15 00		17		15 00
44	24 00		48		24 00
51	8 00		54	9 00	
57	7 50		57	6 50	
			58	3 15	
			61	3 45	

Fig. 65. Top view of the short-cut ledger, with covers removed. See Fig. 64.

Any one who understands double-entry accounting will grasp this system in a few minutes, while a person not skilled in accounts may quickly learn to make the entries by rote.

TABLE XXII.—DAY-BOOK.

1907	Dr.	Transactions	Cr.	
April 1	4	6 bushels apples, at 50 cents . .	3	1
April 2	2	Shoeing bill (at La Points) . . .	1	2
April 8	1	Horse, Jim, sold	2	3
April 8	1	13½ bushels apples, sold at 40 cts.	3	4
April 9	4	Cash on account	1	5
April 9	2	Repairs on harness (Wall & Co.)	1	6
April 11	1	Two colts, sold Bush	2	7
April 25	3	Two days work (Hill)	1	8
April 25	4	2 bushels peaches, $2	3	9
April 25	4	½-bushel cherries, 50 cents . . .	3	10

INDEX.	Page
Cash	1
Teams	2
Orchard	3
Peter Brown	4
Etc.	

For purpose of illustration, four ledger accounts of one column each, are shown in Table XXII. In actual practice, these might occupy separate pages in the ledger. It will be observed that, in opening account with any department having an inventory value, as "Teams," for instance, the inventory is entered on the debit side, in red ink, at the beginning.

On April 1, Peter Brown receives from the farmer six bushels of apples, worth fifty cents per bushel, on account. Turning to the day-book, the date would naturally be first entered. Then, the transaction, "6 bu. apples at 50c.," would be put in its proper space. Who is debtor? Peter Brown has received value, and should be debited to the amount of the transaction. Referring to the index, we see that Peter Brown's account is No. 4 in the ledger, so "4" is put in the column to the left of the transaction under "Dr." Who or what is to be credited? The orchard, in this case, has parted with value, and should be credited. Referring again to the index, we see that the index number

TABLE XXIII.

1 Cash			2 Teams			3 Orchard			4 Peter Brown		
	Dr.	Cr.		Dr.	Cr.		Dr.	Cr.		Dr.	Cr.
			Inv.	$628 00		1		$3 00	1	$3 00	
2		$8 25	2	8 25		4		5 40	5	10 00	
3	$60 00		3		$60 00	8	$3 00		9	2 50	
4	5 40		6	3 68		9		2 50			
5		10 00	7		96 00						
6		3 68									
7	96 00										
8		3 00									

for "Orchard" is "3," so this figure is entered at the right of the transaction.

Turning now to ledger account No. 4, we enter the amount of the transaction, $3, in the debit column, and, likewise, turning to ledger account No. 3 (which might be on another page), we enter the same amount, $3, on the credit side. The figure "1," placed in the reference columns in each of these ledgers, refers to page 1 of the day-book, on which details of the transaction may be found. For convenience in this illustration, every transaction is assigned a number in serial order. This plan might be followed throughout, and make reference very easy and definite, were it not for the fact that when the transactions have become many, the large numbers would be inconvenient to use as reference marks.

Taking the next item, a shoeing bill of $8.25 has been paid, and the receipted bill is before the farmer and will be filed for reference. "Teams" has received value. The account for teams is No. 2 in the index, and 2 is entered under Dr. "Cash" has parted with value. Cash account is No. 1 in the index, and 1 is entered in the column under Cr. This is transaction No. 2, or may be supposed to be on page No. 2 of the day-book. Turn to ledger No. 2, and enter $8.25 on the debit side, and to ledger No. 1, and enter like amount on credit side. Put in the proper reference number in each.

These five day-book items have been selected for illustration from the other day-book because they happen to fit into the ledger accounts given herewith. The reader will see that, with the ledger properly extended, any of the items could be handled in the same way.

So far as taking the trial balance, balancing the separate accounts, and making a gain-and-loss statement are concerned, this short-cut ledger does not require any different treatment from any other.

The inventory values are in the same columns with the transaction amounts, and care should be taken not to include them in taking the trial balance. Other minor differences in the method of balancing the accounts, due to using fewer columns, will suggest themselves, and need no special explanation.

THE COST OF PRODUCING FIELD CROPS

By *Edward C. Parker*

There is great need for accurate cost data in agriculture. Such data as have been gathered on this subject in the past have been too often based on estimates and hasty computations rather than on facts collected by exact methods. In arts other than agriculture, cost data have been compiled and utilized for many years in systematizing management and in making capital and labor highly efficient. The civil engineer and the contractor have recourse to cost data in the engineering professions that are invaluable to them in planning work and in making bids for work. Likewise, the railroad manager is in possession of data concerning operating expense, cost per ton per mile, and similar facts, that are invaluable to him in the successful management of his business. Similar figures accurately gathered would be of great value to the managers of farms if available to him and applicable to his conditions.

The relation that cost bears to gross income and to net profits is too seldom considered by the farm manager. He has need of data concerning the cost of producing animal products and field crops in order that he may properly choose and conduct these farm enterprises in a manner best suited to the economic conditions of markets and labor at his disposal. The investigator in subjects related to crop-rotation and farm management needs to be in full possession of data relating to cost before he arrives at conclusions. The net profits of the rotation or system should determine its worth rather than the gross income.

Collecting cost data of agriculture.

Coöperating with the Bureau of Statistics of the United States Department of Agriculture, the Minnesota Agricultural Experiment Station in 1902 began a number of cost investigations in Minnesota. Some of the compiled figures are presented in this article. The method followed in these investigations was to locate employees of the station in three of the most typical and important agricultural regions of Minnesota. In each region, eight to ten farmers were selected as coöperators and the employee of the experiment station, called a "route statistician," visited each of them daily and secured from the manager a labor report of the work of all men and horses for the previous day distributed to the various crops and farm enterprises. He also collected full data of all cash income and outgo, rates of wages and farm produce consumed in the household, and for three consecutive days in each month lived on each farm and weighed the feed for the various classes of livestock, basing the month's consumption of feeds on a daily average computed from the three days' weights. Inventories were taken at the beginning and close of every year and wagon scales were used in making an inventory of the fat stock and hogs, also to take harvest inventories of grain and forage crops.

These statistics collected in the field were mailed to a central office and compiled in two ways; first, in a double-entry set of books which gives the net profit of each farm; second, in tables that show the cost of producing field crops, animal products, and the like.

Basis for field-crop statistics.

Cost per acre, rather than cost per bushel or per ton, has usually been made the basis for studying the cost of producing field crops. Cost per bushel or per ton varies so greatly with yield that such figures mean little except as long time-averages of yield are obtained. As a general rule, the cost of producing, for example, a twenty-bushel crop of wheat, will vary but little from the cost of producing a ten-bushel crop, and the slight difference will occur mainly in harvesting and threshing. So, too, with forage crops, the cost per acre does not increase in proportion to tonnage, and the cost of curing and storing a four-ton crop of hay is not much greater than in the case of a two-ton crop. This does not mean that yield can not be made to vary with cost of production, but that yield varies greatly through the changes in climatic conditions when land is given the same preparation in successive seasons.

Comparisons of economy of production and of the various methods of growing crops are, therefore, more equitably made on the acreage basis than on the unit of product basis.

Total cost of crop-production.

Labor.—The cost of labor forms one of the largest items in the cost of crop-production, particularly in periods of high wages. In addition to the cash wages paid farm labor, the laborer receives his board and lodging. The actual cost of board on farms must, therefore, be determined and added to the cash wage in order to ascertain total labor cost. In Table I, the cost per month and per day of farm board is shown for three counties of Minnesota, averaged for 1905 and 1906:

TABLE I.—AVERAGE COST OF FARM BOARD PER MONTH AND PER DAY, 1905–1906.

	Month	Day
Southeast Minnesota	$12 27	$0.409
Southwest Minnesota	11 90	.396
Northwest Minnesota	11 06	.368

Having determined the total cost of keeping a farm laborer for a month, that is, wages and board, a rate per hour for this class of labor can be determined by dividing this sum by the total hours the laborer worked during that month, and this rate, when multiplied into the hours of work, on any crop or enterprise, will give the cost for that enterprise. When labor is employed by the day and paid a special rate, the method of distributing labor-cost to the various enterprises is similar to the method for regular labor hired by the month—the hours of labor for each class being kept separate. The labor of proprietors and boys is charged up at the same rate used for "month labor," it being assumed that the managing ability of the farmer will receive a reward in net profits, and that his manual labor is worth no more than that of ordinary labor.

In Table II, the rate per hour for regular labor by the month, is shown for every month in the year, averaged from three counties in Minnesota, for the years 1904, 1905 and 1906:

TABLE II.—RATES PER HOUR FOR LABOR BY THE MONTH. 1904, 1905, 1906.

Month	Cents
January	0.1076
February	.1136
March	.0962
April	.1181
May	.1171
June	.1252
July	.1283
August	.1187
September	.1226
October	.1222
November	.1266
December	.1065

In the study of labor conditions on the farms of the upper Mississippi valley, the statistics of average hours of labor per day by farm laborers, exhibited in Table III, are interesting. The actual hours

TABLE III.—HOURS WORKED PER DAY BY MEN AND HORSES ON STATISTICAL ROUTES AT NORTHFIELD, MARSHALL AND HALSTAD, MINNESOTA. AVERAGE FOR THREE YEARS, 1902, 1903, 1904.

Month	Northfield (Rice county)			Marshall (Lyon county)			Halstad (Norman county)		
	Daily		Sunday	Daily		Sunday	Daily		Sunday
	Man	Horse	Man	Man	Horse	Man	Man	Horse	Man
January	6.57	1.20	4.22	5.80	0.71	3.60	4.69	0.85	2.57
February	6.48	1.22	4.16	5.86	0.77	3.33	5.32	1.02	2.53
March	7.59	1.41	4.03	7.00	1.59	3.12	5.83	1.01	2.53
April	9.67	4.47	3.71	8.74	4.64	2.81	6.36	1.86	2.21
May	8.69	4.04	3.10	9.46	5.02	2.48	8.90	5.84	2.14
June	9.22	3.49	2.82	9.36	3.68	2.34	8.14	3.38	1.94
July	9.23	3.33	2.72	9.17	3.50	2.16	9.30	3.72	1.96
August	9.79	4.81	2.66	10.04	5.31	3.04	9.67	5.27	1.92
September	10.11	4.18	2.79	9.42	5.13	2.55	9.07	5.97	1.99
October	9.67	4.35	2.79	9.23	4.61	2.60	9.05	6.81	1.93
November	8.94	3.11	3.43	8.83	3.40	3.21	7.42	2.95	2.17
December	7.17	1.38	4.33	6.52	1.13	3.38	5.45	0.90	2.34
Average	8.59	3.08	3.40	8.29	3.29	2.89	7.43	3.30	2.19

NOTE.—These figures are compiled and averaged from eight to fifteen farms on each statistical route and include the work of hired laborers, resident laborers of all ages, and all horses kept on the farms as work horses. The figures in the daily column are averaged for 313 working days in the year, no account being taken of holidays. The number of hours worked by the horses seems exceedingly small; but it should be remembered that, under ordinary methods of farm management, farm horses are idle a considerable portion of the year, and that the farmer, in order to have the use of a number of good teams in seeding and in harvest, is obliged to feed and maintain them through the entire year.

per day of labor are shown to be no greater than in the case of the mechanic or city worker. At many seasons, the farm laborer works a long day of from twelve to sixteen hours, but at other seasons his chores constitute the day's work, thus lowering the average. On many farms, the proprietor does not work so long hours as the hired man, and this factor also tends to reduce the average per day for all classes of farm labor.

Horse labor.—The cost of horse labor on farms is based on the cost of feeding and maintaining the work horses which furnish the motive power. This cost includes depreciation charges, interest on investment, feed, shoeing, labor of feeding, grooming and harnessing and miscellaneous expenses such as veterinary attendance. The total cost per year of keeping a farm work horse is shown in Table IV, also the rate per hour of horse labor, this rate being obtained by dividing the total yearly cost of keeping the farm work horses by the total number of hours worked by the horses.

TABLE IV.—TOTAL YEARLY COST OF MAINTAINING A FARM WORK HORSE AND RATES PER HOUR FOR HORSE LABOR. AVERAGE FOR 1905–1906.

	Total cost	Rate per hour
Southeast Minnesota	$80 14	$0.090
Southwest Minnesota	78 06	.082
Northwest Minnesota	72 93	.075

Values consumed in farm machinery.—The cost to the farmer of machinery used in crop-production is not represented by the one item of depreciation, but is a cost composed of depreciation, cash and labor repairs and interest on the average investment in each machine during its life. These various items of machine cost are totaled and exhibited in Table V for the various classes of farm machinery. The total cost has been reduced to the acre cost by dividing total cost by the average acreage per year, cut, plowed and the like by the various machines:

TABLE V.—VALUES CONSUMED PER ACRE FOR FARM MACHINERY.

Machines	Northfield (Rice county)	Marshall (Lyon county)	Halstad (Norman county)	Sabin (Clay county)	Minnesota average	Large farms in northwestern Minnesota
Grain machinery—						
Binders	.220	.153	.131	. . .	.168	.110
Reapers	. .	. .	. .	. . .	. .	.051
Drills and seeders	.059	.094	.087	. . .	.080	.031
Fanning mills	.028	. .	. .	. . .	.028	.002
Grain tanks	. .	. .	. .	. . .	. .	.009
Wagons, sleds and racks	.034	.033	.058	. . .	.042	.030
Corn machinery—						
Binders	.789	.770	.440	. . .	.666	. .
Planters	.069	.115	. .	. . .	.092	. .
Cultivators	.107	.090	.129	. . .	.109	. .
Wagons, sleds and racks	.132	.110	.043	. . .	.095	. .
Hay machinery—						
Mowers	.287	.213	.139	. . .	.213	.155
Rakes	.102	.114	.067	. . .	.094	.016
Wagons, sleds and racks	.051	.051	.127	. . .	.076	.057
Potato machinery—						
Plows	. .	. .	. .	.0520	. .	. .
Harrows	. .	. .	. .	.0140	. .	. .
Wagons	. .	. .	. .	.0580	. .	. .
Sorters	. .	. .	. .	.0142	. .	. .
Diggers	. .	. .	. .	.2470	. .	. .
Weeders	. .	. .	. .	.0307	. .	. .
Cultivators	. .	. .	. .	.0278	. .	. .
Sprayers	. .	. .	. .	.0700	. .	. .
Planters	. .	. .	. .	.0830	. .	. .
All crop machinery—						
Plows	.088	.065	.052	. . .	.068	.041
Harrows	.017	.011	.014	. . .	.014	.005
Disks	.025	.098	. .	. . .	.061	. .
Threshing outfit	. .	. .	. .	. . .	. .	.288

NOTE.—The values in farm machinery consumed annually per acre have been ascertained from an average of four years. The values consumed in harrows and disks do not represent the proper charge for one harrowing and one disking, but for the number of harrowings and the number of diskings that are commonly given the total acreage covered by these implements in the various sections of Minnesota where the statistics were collected. The number of harrowings on which this depreciation charge is based is approximately three and the number of diskings two.

The total value of machinery consumed per acre by any field crop may be obtained from this table by adding the values consumed in those machines which are used in planting, tilling, and harvesting. Thus at Halstad, in Norman county, the machinery charge for producing an acre of wheat is as follows: Plows, 5.2 cents; harrows, 1.4 cents; drills, 8.7 cents; binders, 13.1 cents, wagons, 5.8 cents; fanning mills, 0.2 cents, making a total of 34.4 cents. The total machinery charge for a corn-crop at Northfield, Rice county, is: Plows, 8.8 cents; harrows, 1.7 cents; planters, 6.9 cents; cultivators, 10.7 cents; wagons, 13.2 cents; binders, 78.9 cents, making a total of $1.202.

The rental value of land.

The rental value of land is not ordinarily considered by farmers as an item of expense in the farm business, especially in new farming regions where prospective rises in land values are included in the expectancy of profits. This item can not be ignored, however, in determining cost of production or net profit. A reasonable charge must be made for the productive capacity of capital as well as for labor. The two are inseparable in carrying on production, and wages must be paid to labor and interest to capital in order to induce them to enter any industry. There is undoubtedly a great deal of capital invested in agriculture that is not drawing interest at commercial rates. Nevertheless, whenever capital can be withdrawn from agriculture and draw 6 per cent in other investments, the business of agriculture must be debited with an expense of 6 per cent interest charges on the investment. Receipts over and above the charges for labor, general expense, and capital in form of land and machinery may be considered as net profit. Thus a land rental based on an interest charge on the acre value of land is included in all crop costs presented in this article.

Cost of operations in producing spring wheat, corn and potatoes.

The figures given in Table VI on the cost of producing field crops represent averages for the years 1902–1906, from all the farms in Minnesota on which statistics were collected. The various items have been compiled separately for the three regions and counties because of the varying land values and various systems of farming in vogue. The various labor operations charged against the crops represent the operations performed by the majority of farmers in the community where the statistics were gathered. The items of seed and twine and other miscellaneous costs have been reduced to the acreage basis and included in the tables showing the cost per acre.

The individuality of the farms and of the farmers has been almost entirely eliminated in the statistics presented in these tables, because these statistics are made up from many fields during a series of three or more consecutive years. The individuality of one farmer has been preserved in the data from a large grain farm in northwestern Minnesota. This farm of 1,800 acres, situated in the great Red river valley region of Minnesota is typical of the large farms and extensive methods of grain-growing found in this region.

The cost per acre of marketing farm products has not been here included in the compiled statistics of cost of production. The cost per acre of marketing varies so greatly with distance hauled, size of load, condition of roads and yield per acre that it was deemed advisable to omit it from these tables. It is an expense that must not be ignored, however, and falls heaviest on those crops that are marketed directly, as wheat and flax, and least on those crops that are condensed by feeding them to live-stock.

The cost of marketing grains was found to be from fourteen to twenty cents per ton per mile under the conditions of these farms, which were two to ten miles from town.

TABLE VI.—COST OF PRODUCING WHEAT ON FALL PLOWING.

Operation	Marshall (Lyon county)			Halstad (Norman county)		
	Total acreage, three years	Total cost	Cost per acre	Total acreage, three years	Total cost	Cost per acre
Seed value	3,075.63	$2,979 05	$0.969	4,248.15	$3,420 91	$0.805
Cleaning seed	....	....	...	4,017.32	106 11	.026
Plowing	2,167.81	2,194 04	1.012	3,883.63	4,117 62	1.060
Dragging	3,394.83	542 56	.160	4,236.15	1,139 40	.269
Seeding	3,492.17	796 32	.228	4,248.15	1,145 52	.270
Weeding	....	....	...	3,501.44	278 27	.079
Cutting (binder)	3,501.38	1,088 30	.311	4,209.03	1,388 22	.330
Twine	3,017.83	902 23	.299	2,126.25	377 37	.177
Shocking	3,174.76	321 34	.101	4,209.03	508 66	.121
Stacking	2,259.22	1,097 13	.486	1,869.19	823 78	.441
Stack-threshing (labor)	1,104.64	271 57	.246	718.05	143 23	.199
Cash cost, threshing	1,104.64	797 06	.722	718.05	244 90	.341
Machinery cost	....	....	.356	....	....	.344
Land rental	....	....	3.000	....	....	1.800
Total	....	....	$7.890	....	....	$6.262

NOTE.—The average yield of wheat at Marshall during the years 1902, 1903, 1904 and 1905 was 14.5 bushels; at Halstad, 13.3 bushels. These yields of wheat are below the average for these sections of Minnesota. The rust epidemic of 1904 and the wet year of 1905 reduced the yields by fully one-third. The average cash price for No. 1 northern wheat in Minneapolis during the year 1902, 1903 and 1904 was eighty-five cents.

The average yield of wheat in Minnesota for the years 1895 to 1904, according to the Bureau of Statistics of the United States Department of Agriculture, was 14.3 bushels, having an average farm value of $8.87 per acre. The cost of marketing wheat is twenty-five cents to fifty cents per acre, leaving a net profit of about two dollars to the farmer producing wheat on improved farms in Minnesota. The margin of profit is somewhat greater on the big wheat farms, as the cost of production is usually less than that on the smaller farms.

Wheat can be grown in Minnesota to much greater profit if rotated with other field crops. The same methods employed in growing wheat on $30, $40, and $50 land as were employed in the early days of continuous grain-growing on $10 land will yield little or no net profit, and the future grain-growers of the Northwest must realize this fact if wheat is to be grown successfully and profitably

TABLE VI, Continued.

LARGE FARM IN NORTHWESTERN MINNESOTA.

Operation	Total acreage three years	Total cost	Cost per acre
Seed value	3,200.41	$2,869 05	$0.896
Cleaning seed	3,198.41	54 37	.017
Plowing	3,200.41	2,685 14	.839
Dragging	3,200.41	863 40	.270
Seeding	3,200.41	763 22	.238
Weeding	3,200.41	99 21	.031
Cutting (binder)	3,200.41	1,032 16	.323
Twine	3,200.41	579 27	.181
Shocking	3,200.41	411 86	.129
Shock-threshing (labor)	1,536.35	895 10	.583
Values consumed in threshing rig	....	....	.289
Machinery cost	....	....	.228
Land rental	....	....	1.800
Total	....	....	5.824

TABLE VII.—COST OF PRODUCING CORN (EARS HUSKED FROM THE STANDING STALKS).

Operation	Northfield (Rice county)			Marshall (Lyon county)		
	Total acreage, three years	Total cost	Cost per acre	Total acreage, three years	Total cost	Cost per acre
Manuring	602.68	$868 08	$0.576	775.41	$1,140 48	$0.588
Seed value	509.35	108 68	.213	776.71	128 36	.165
Shelling seed	411.07	9 57	.023	467.37	13 06	.028
Plowing	605.89	730 28	1.205	579.78	602 50	1.039
Dragging	791.75	380 37	.480	681.97	305 12	.447
Planting (horse-planter)	670.83	150 72	.225	711.08	180 27	.254
Cultivating	776.34	1,256 61	1.619	701.16	934 71	1.333
Weeding	...	....	...	133.04	14 57	.110
Husking on hill	331.32	1,164 77	3.516	169.21	440 09	2.601
Machinery cost	...	....	.413	...	....	.391
Land rental	...	....	3.500	...	....	3.000
Total	...	....	11.770	...	....	9.956

NOTE.—The average yield of corn at Northfield and Marshall for the years 1902, 1903 and 1904 was from forty to forty-five bushels per acre, and the average price for No. 3 yellow corn at Minneapolis during the three years was fifty cents. No accurate data are at hand on the value of an acre of the standing stalks for pasture. Fifty farmers in Minnesota, in answer to an inquiry from the experiment station, estimated the pasture value of an acre of cornstalks at one dollar to one dollar and a half.

Statistics gathered from a small acreage show that marking the land and hand planting increases the cost of production by thirty-four cents per acre. Forty per cent of the total cost of manuring is charged to the corn-crop. It is manifestly unfair to debit the crop of corn with the entire cost of manuring when the effects of manuring land can be traced in at least four or five succeeding crops. In the absence of specific data concerning the draft of crops on a dressing of manure, the corn-crop is debited with 40 per cent of the cost of manuring, it being assumed that as corn is the first crop to follow the manuring, and as it is an exceedingly gross feeder, it will utilize 40 per cent of the fertility in the manure. The cost of manuring the corn crop is distributed over the entire acreage devoted to corn, although a majority of the fields are only partially manured. This accounts for the low cost of manuring per acre shown in this table and succeeding tables for the corn-crop.

In figuring the cost per acre of husking ears from the standing stalks, all labor of men and horses was charged at the rates per hour for October and November as shown in Tables IV and VII. Practically all the husking done in these sections of Minnesota is done by regular month labor and by proprietors. Labor is therefore charged at the rates for month labor instead of day-labor wages, or wages paid by the bushel, as is the custom in some localities. Horse labor is charged at regular rates, as an item of expense in husking corn, in order to make the expense of this operation comparable with the cost of cutting and shredding corn and because there is no justification for omitting this charge from the cost of husking corn. It is true that the work of husking is easy for a team and that horses will increase rather than decrease in value while performing this work; yet while horses may be easily kept at this work, it is done at the expense of the corn-crop. It takes a reliable team, moreover, to do this work satisfactorily, and if a team is used in husking instead of plowing, there is no good reason why horse labor should not be charged to husking the same as the plowing and seeding.

Husking ears from the standing stalks is undoubtedly done somewhat cheaper farther south in the corn-belt than in Minnesota, owing to the greater proficiency of labor in this particular operation and to the larger-sized ears, which are more readily handled. The figures in this table are representative of the sections in which they are gathered, and are comparable with all figures for handling the corn-crop by other methods described in this article. Statistics secured by correspondence with a number of farmers in the corn regions of Minnesota indicate that husking corn out of the shock costs from seventy-five cents to one dollar more per acre than to husk from the standing stalks.

TABLE VIII.—COST OF PRODUCING CORN, THICKLY PLANTED AND SILOED. AVERAGE OF FOUR FARMS IN SOUTHEASTERN MINNESOTA, 1906–07.

Operations	Acreage	Total cost	Cost per acre
Manuring	181.15	$329 32	$0.727
Seed value	194.54	97 27	.500
Plowing	173.76	230 67	1.328
Harrowing	184.85	98 13	.531
Planting	166.59	48 45	.291
Cultivating	166.01	175 30	1.056
Cutting (binder)	82.89	62 52	.754
Twine, 423½ pounds	82.89	44 12	.532
Loading, hauling, feeding and packing	82.89	447 10	5.393
Fuel (coal, 13,730 pounds)	70.89	37 94	.540
Engine rent and engineer	70.89	96 34	1.358
Values consumed in ensilage cutter	45.00	18 00	.400
Interest on silo investment	82.50	60 12	.728
Silo depreciation	82.50	117 99	1.429
Farm machinery cost	. . .	. . .	1.202
Land rental	. . .	. . .	3.500
Total	. . .	. . .	$20.269

NOTE.—The cost of manuring, seed value, plowing, harrowing, planting and cultivating is taken from data on the cost of producing fodder corn at Northfield, Rice county, Minn. The labor of harvesting the crop and storing in the silo is figured from four farms in southeastern Minnesota, for the years 1906 and 1907 the labor being partly day help and partly regular month labor. When labor in harvesting and storing is exchanged among farmers so that no high-priced day labor need be included in the cost, the total cost of producing an acre of silage as determined from above amounts of labor and converted into cash values at month wages is $18.822 The cost per acre of producing silage at the Minnesota Agricultural Experiment Station—average 1905, 1906 and 1907—is $19.173. This cost ($19.173) has been used in Table XI because it represents the minimum cost of producing silage under good management.

The use of the gasolene engine in place of renting the steam engine will usually cheapen the cost of production. Three farmers owning a gasolene engine in partnership report the power cost per acre at eighty-two cents, this amount including depreciation, interest on investment, repairs and gasolene.

The yield per acre as determined from the silage mass was 9.59 tons on the four farms in southeastern Minnesota, and the average yield on the experiment farm as determined from wagon scale weights was 10.84 tons.

TABLE IX.—COST OF PRODUCING POTATOES (CLAY COUNTY, MINNESOTA, 1907).

Operations	Acres	Total cost	Cost per acre
Seed value (3,984 bushels)	331.643	$1,925 00	$5.803
Plowing	2,790.984	3,322 25	1.190
Harrowing	331.643	60 96	.180
Cutting seed	331.643	265 68	.801
Planting	331.643	205 68	.620
Weeding (horse-weeder)	331.643	180 41	.544
Cultivating (three times)	331.643	920 54	2.775
Spraying (three times)	331.643	97 55	.294
Paris green	331.643	425 00	1.281
Blue stone	331.643	175 00	.527
Digging	331.643	443 88	1.338
Picking up 42,000 bushels at 3½ cents per bushel	331.643	1,470 00	4.432
Machinery cost	. . . .	. . . .	.596
Land rental	. . . .	. . . .	3.000
Total	. . . .	. . . .	$23.381

NOTE.—When stable manure is applied to the potato-crop, the cost of hauling and distributing manure should be added to the total cost here given. This cost, figured from 125 acres, amounts to $1.97 per acre when manure is spread with a three-horse spreader at the rate of eight tons to the acre. The cost of marketing should also be added, and has not been included in this table because it varies so with the distance hauled, size of load and kind of road.

Producing field crops.

In Table X summarized figures are given on the cost of producing the various field crops in Minnesota. These statistics are compiled for each crop by the same methods as in Tables VI, VII, VIII and IX.

TABLE X.—TOTAL COST PER ACRE OF PRODUCING FIELD CROPS IN MINNESOTA.

Crop	Northfield (Rice county)	Marshall (Lyon county)	Halstad (Norman county)	Sabin (Clay county)	Minnesota Experiment Station	Large farm northwestern Minnesota
Barley, spring plowing	$9.135	$8.576	$6.410	. . .	. . .	$5.967
Corn, ears husked from standing stalks	11.770	9.956	. . .	. . .	. . .	. . .
Corn, cut, shocked and shredded	14.745	. . .	. . .	. . .	. . .	. . .
Corn, cut, shocked and hauled in from the field	. . .	11.020	. . .	. . .	. . .	. . .
Corn, grown thickly and siloed	20.269	. . .	. . .	. . .	$19.173	. . .
Flax, threshed from windrow	9.828	. . .	6.871	. . .	. . .	. . .
Flax, unbound, stacked and threshed	. . .	8.861	6.727	. . .	. . .	6.139
Flax, bound, shocked, stacked and threshed	. . .	9.260	. . .	. . .	. . .	. . .
Fodder corn, cut and shocked in field	10.526	. . .	8.076	. . .	. . .	7.518
Fodder corn, cut, shocked and stacked	12.197	. . .	. . .	. . .	. . .	. . .
Hay (timothy and clover), two cuttings	6.966	. . .	. . .	. . .	. . .	. . .
Hay (millet)	9.184	8.162	5.973	. . .	. . .	. . .
Hay (wild grasses)	5.850	5.179	2.872	. . .	. . .	2.286
Hay (timothy)	. . .	. . .	. . .	. . .	. . .	3.302
Mangels	. . .	. . .	. . .	. . .	34.128	. . .
Millet, cut for seed	9.383	. . .	6.584	. . .	. . .	. . .
Oats, fall plowing	9.837	8.829	6.311	. . .	. . .	. . .
Oats, disked corn stubble	9.002	. . .	. . .	. . .	. . .	. . .
Potatoes	. . .	. . .	. . .	$23.381	. . .	. . .
Rye, spring sown	. . .	. . .	. . .	. . .	. . .	6.090
Timothy, cut for seed	5.957	. . .	. . .	. . .	. . .	4.079
Wheat, fall plowing	. . .	7.890	6.202	. . .	. . .	5.824

NOTE.—The figures in Table X are for the most part from well-tilled fields where the crops are given a chance to produce good average yields, somewhat better than statistics show for the entire state of Minnesota. Farmers who secure smaller yields usually expend less labor and other items of expense than was used on this land. Whenever comparisons between the costs of production for various crops are to be made the statistics should be used from the same section of the state and not from different sections. This is necessary to make a just comparison, as land rental, machinery cost, and labor vary with the different sections in which the statistics were gathered.

Statistics and farm management.

TABLE XI.—MINNESOTA FORAGE CROPS. COST OF PRODUCTION AND FEEDING VALUE.

Crop	Cost of production per acre	Feeding value per ton	Average yields		Maximum yields	
			Yield per acre, tons	Feeding value per acre	Yield per acre, tons	Feeding value per acre
Clover and timothy	$6.96	$6.35	2½	$15.87	3	$19.05
Fodder corn	12.19	4.90	3½	17.15	4	19.60
Ensilage	19.173	1.88	10	18.80	12	22.56
Mangels	34.12	1.30	20	26.00	30	39.00

NOTE.—The term "average yields" is used to designate the yields commonly secured on the better class of Minnesota farms. "Maximum yields" are occasionally higher than the yields quoted here, but these yields are the highest ordinarily obtained.

The cost of production will vary somewhat with yield, the cost of harvesting being somewhat higher for the maximum yields. As these figures have not been obtained for the high tonnage the cost of production in both cases is the actual cost for average yields. The total cost per acre for the maximum yields would be only slightly in excess of the cost of average yields and the cost per ton much less

The comparative feeding values of the various forage crops are taken from experimental work of T. L. Haecker, Minnesota Agricultural Experiment Station.

It is not our purpose to discuss at any length the problems of farm and crop management. As previously stated, cost of production in agriculture, as well as in all other industries, is the basic point from which the management and conduct of the business can best be studied. Profit and loss should determine all methods of management, and it is hoped that the statistics presented in this article on cost of production, if properly interpreted, will be of much value to teachers and practical farm managers, in outlining methods of farm and crop management.

To illustrate the manner in which the figures on cost of production may be used in problems of farm and stock management, Table XI shows a problem in the economy of forage crop-production.

It may be seen from Table XI that with average yields $1 expended in labor and capital with hay will give a return of $2.28, with fodder-corn $1.40, with ensilage 98 cents and with mangels 76 cents. Ensilage and mangels are undoubtedly expensive feeds as compared with hay and fodder-corn. Ensilage is a profitable crop and utilized to advantage when the type of farming is intensive dairying, when markets are stable and when the cows are high producers. Under these conditions and when the silo is of large capacity the crop is profitable because it increases the number of cows that can be supported on a small acreage, thus increasing gross income and warranting the high cost of production. But for the farmer who milks but a few cows and carries on diversified farming, winter forage in the shape of hay supplemented with a few mangels, gives a much cheaper feed.

THE THEORY OF THE MIDDLEMAN

By *Frank A. Fetter*

A middleman is any one who acts as a buyer and seller for profit; he is midway between producers and consumers. Every one buying not for his own use is a middleman unless he is acting as the agent of another and is paid a definite wage. The two main questions of interest regarding the middleman are: First, why is he here? and second, can he be got rid of? The answer to the second is easier after the answer to the first.

Rise of the middleman system.

In a simple society where a family produces everything it consumes, there is no exchange, and of course no middleman. The members of savage tribes meet on the borders of their territory and exchange the different products peculiar to their districts. The negroes on the coast of Africa take salt and fish into the interior and barter with the hunting tribes for meat, ivory, leather and feathers.

As trading increased in amount, that not done in the neighborhood came mostly to be done at regular times and places. Thus grew up markets and fairs to which people came in great numbers from long distances. Much of this trading at the fairs in medieval Europe was directly between producers; but a special class of traders (middlemen) had already appeared. Neighbors entrusted some one with their produce and their purchases, giving him a share for his trouble. Nearly all foreign trade was done by merchants, and in general the farther the goods were taken from the place of their production, the greater the need of the services of the middleman.

In the American colonies where each family produced the larger part of all it used, there was little need of the middleman, and population was so sparse that markets and fairs were not common. The families raised sheep, spun the wool, and generally made their own clothes. But the more difficult tasks were done by skilled laborers, tailors, shoe-makers, carpenters, smiths, tinkers, who lived at the cross-roads or in the towns, or who traveled from house to house, living with the family while they made the articles needed. Peddlers and hucksters traveled through the country buying products to be sold at a distance and paying in trade with manufactured goods and rarities from abroad. Trading posts sprang up on every frontier, and stores were opened in the villages and towns.

Every improvement in transportation, every invention that made factory products cheaper, every increase of population, caused some families to produce a smaller part of the things needed for their own use. This meant in every case more exchanging, and in nearly every case more work for the middleman. The amount of exchanging, however, and especially the amount done through middlemen, continues even to this day to be less in farming communities than in city districts.

Kinds of middlemen.

Many kinds of middlemen are found in modern society: Sales agents such as real estate brokers and commission merchants, who are themselves not the owners of the goods, but act as go-betweens to bring together the owner and a possible purchaser; outright buyers and sellers of goods such as peddlers, hucksters, small shop-keepers, retail and wholesale merchants of many kinds; dealers in credit, coming between the borrower and lender of money, including commercial banks, trust companies, savings banks, and various other brokers and money dealers; manufacturers, some mainly concerned with the buying and selling, changing the goods only enough to fit them better for sale, as by cleaning, sorting, packing, others completely altering the form and look of goods passing through their hands, as by buying rough lumber and selling finished furniture.

Economic cause for the middleman.

It is evident that these various middlemen must in some way be useful to their patrons. Every consumer is free to try to deal directly with the producer and every producer with the consumer of his goods if he thinks the middleman is charging too much for his services or is not doing the work well. The middleman must answer more or less roughly to the test of economy, or he will cease to be used. The gardener has his choice between selling his vegetables from house to house or selling them to a middleman at a lower price, and, with the time he thus saves, raising a larger amount of produce. The consumer may either take the time to go direct to a producer and buy more cheaply or stay at his regular work and earn a larger sum of money with which to pay the middleman's profits.

In nearly every case where the middleman continues to make a livelihood, he can and does do the work more economically than his customers could under the existing circumstances; the last is an important condition. Buying and selling every day he gains skill in judging the quality of goods, and knowledge of the capacity of producers and of the desires of consumers. He saves expense by carrying on business on a larger scale. In a single trip he may collect goods from a score of producers and deliver to a hundred consumers. He may keep a stock from which the customer can select and get immediate delivery. These advantages combined may make the middleman so superior in exchanging, that every one finds it of advantage to employ him.

Evils of the middleman system.

But there are not lacking evils in "the middleman system" of exchange. The middleman sometimes comes between exchangers in unfortunate ways. The farmer selling through a middleman is spared the trip to market, but he misses the social element of market day which, to one of solitary occupation, may have more than a money value. Then too, competition among middlemen may become excessive and wasteful. Several may cover the same territory, have numerous rival stores on the same street, expend large sums for advertising, and be forced to charge high prices; the public thus loses most of the benefits of the plan. Again, when he has outstripped his rivals, the middleman may have a monopoly power over his customers (witness the Standard Oil Company, the tobacco trust, and others). Again, the method of selling through middlemen once becoming established, may prevent the growth of a better method. Improved roads, transportation, daily delivery of newspapers with market quotations, the rural telephone and farmers' granges may have long since reduced the need of the middleman's services; yet he continues to be employed.

Exchange as production.

The theory of the middleman is a part of the general theory of value. At one time and place a thing may have great value, at another time and place no value, or may be positively injurious. It is the function of the carrier and of the middleman to bring things into relation with wants at a better time or at a more convenient place. The middleman's service may be partly that of transporting, partly that of bringing to the user, partly that of bringing together the seller and the customer, partly that of keeping the goods where customers may examine and select conveniently. The middleman, like any other producer, may make a mistake and thus fail to be productive, at times he may be wasteful rather than economical, of disadvantage rather than of advantage; but his work may be, and generally is, as truly productive as is the farmer's work. The social task of the middleman is to be a "labor-saving device" to producer and to consumer, and his existence is justified only so long as he continues to meet that test.

Doing away with the middleman by coöperation.

Since the middleman comes between the producer of goods and the consumer, he may be viewed from either one's point of view. It may seem to the producer that the middleman is making his profits by reducing the price paid the producer, or it may seem to the consumer that the profits are added to the selling price. The question of doing away with the middleman arises in this connection. What is the chance of displacing or eliminating the middleman?

This question is most frequently raised in relation to the subject of coöperation,—for it is rarely proposed to revert to barter. Many costly blunders have been made in ill-advised attempts to do away with the middleman before the nature of his work or the difficulty of performing it were appreciated. Inexperienced coöperators overlook many elements of necessary cost that they must meet as well as the middleman. Such losses are: Loss by fire or the regular premium of insurance to offset it; breakage, leakage and destruction of goods; shelf-worn or old-style stock; bad debts; reasonable interest on the investment represented in the stocks and accounts; rent of store-room; cost of maintaining light, heat and repairs; clerk hire (not to be overlooked even when the coöperators themselves act as clerks); mistakes in the ordering and shipping of goods; advertising, taxes, and many other costs.

It is true that coöperators may economize in many of these items. Honest neighbors forming a society of consumers may eliminate bad debts, costly book-keeping and advertising. They may reduce rent by keeping the store on a less expensive site or by using their own grounds and buildings; may limit breakage and loss from old stock by ordering staple goods and for definite needs. Because of the importance of the economies that may be made by a group of consumers, the most successful attempts to eliminate the middleman have been in "consumers' coöperation." In productive coöperation the greatest success has been obtained when the conditions were, on the whole, pretty simple, the goods of staple quality, and the market a very certain one.

Coöperators must meet certain conditions if they would succeed in displacing the services of the middleman. They must be intelligent, must understand the conditions, must study the markets, and must apply the same judgment that a merchant does in his business. They must order goods of the right kinds and qualities, and in right amounts. Successful coöperation requires more integrity and civic spirit than is found in ordinary competitive business. It requires close and friendly social relations among the coöperators, for there is great chance of misunderstanding and complaints tending to destroy the coöperative enterprise.

Limiting the middleman.

It is evident from the foregoing that no sweeping statement that will hold can be made regarding the necessity of the middleman. At one time a farmer may be so situated that he can easily sell poultry, dairy or orchard products direct to consumers, thus getting not only all the middleman's profits, but an extra price because of the freshness and quality of the goods. Other crops may at the same time more advantageously be marketed through a coöperative company made up of the farmers themselves. Still other products may be more economically marketed through middlemen, especially staple products that have a wide market, the prices of which are fixed by general conditions, and when competition among the middlemen is active and general.

In some cases, it may be the more economical policy for producers or consumers to attempt to control and limit the middleman rather than to abolish him. "Collective bargaining" as employed by trade unions may be resorted to by farmers or

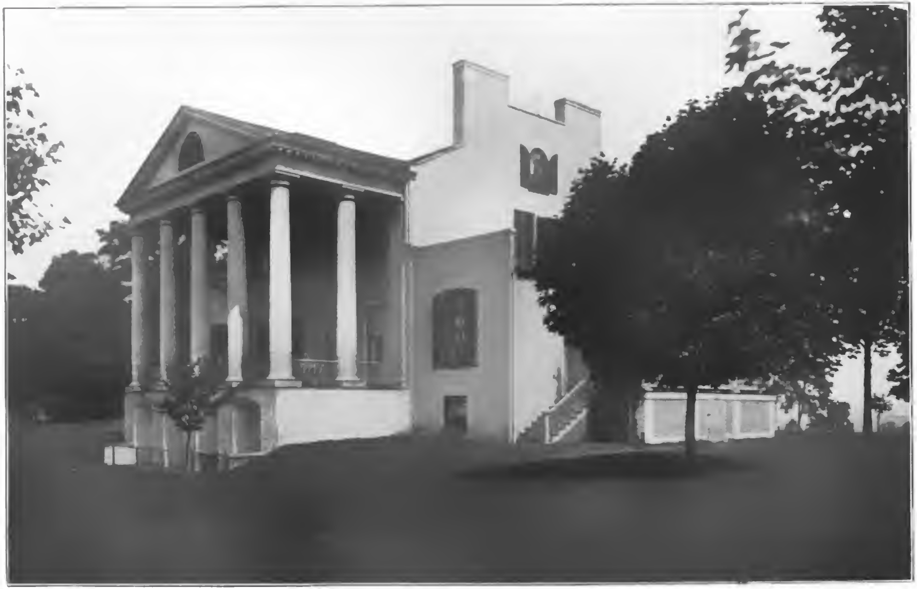


Plate XII. An old-time country-seat. Oak Hill, Loudoun county, Virginia, residence of Henry Fairfax, breeder of Hackney horses (Plate XV, Vol. III.) This residence was built by James Monroe, when president of the United States, and here he resided until his death

other citizens combining and making a bargain whereby merchants agree to sell to the coöperators at special rates, or to act as selling agents for their products at smaller commissions, on condition of securing all the trade and of getting cash payments. Merchants in this way can afford to give to the customers a considerable part of the saving in advertising, bad debts, and the like.

The plan has advantages over coöperative stores in that it calls for no investment of capital, for no elaborate business organization, and involves no risks. Any measures that tend to decrease the tolls levied between consumers and producers, to reduce the complexity of exchange, and to eliminate wasteful competition without diminishing the spur of enterprise, must be deemed economically desirable. It is well to have various agencies working side by side in competition with each other, each thus holding the others up to a higher standard of efficiency.

The farmer is less accustomed to the middleman than is the town dweller. Perhaps for that reason the farmer less fully recognizes the real economic function that the middleman performs. Energy is wasted in opposing a service that is truly needed. Yet, there are some good reasons for complaint, and in no other field is there a better chance of limiting the abuses of the middleman system than among the farmers of the new agriculture with their opportunity for close friendship, their progressive education, their developing business ability, and their improving social relations.

THE MIDDLEMAN IN PRACTICE

By *P. M. Kiely*

The middleman, otherwise known as commission merchant and distributor, occupies a wider and much more important field than is generally supposed. He is a necessity and cannot be dispensed with; since trading on a large scale began, his services have been needed and probably always will be needed. Farmers' clubs, horticultural and agricultural organizations, have debated the middleman and have tried repeatedly to outline a scheme to dispense with his services by sending their products directly to the consumers, thus saving the distributors' charges. The more these people investigated the situation the more convinced they became that it was impossible successfully to displace him.

The position of the middleman in the distribution of the perishable crops of the country has never, perhaps, been covered in any contribution to the press, agricultural journals, trade papers, or through any other channel. It is one of the callings that have been overlooked by expert writers. The average producer, therefore, has no conception of the magnitude of the work nor of the expenses attached to getting his crops to the consumers.

The men most interested in this subject—the producers and shippers of the country—would be surprised at the enormous expense to which the middlemen are exposed and at what it costs to reach the consumer. The figures herein given will reveal why they do not receive a larger share of the money the consumers pay for their products.

Kinds of middlemen.

There are four different sets of middlemen engaged in the distribution of the fruits and vegetables of the country, which we will designate as perishable crops. By reason of their perishable character these crops require a large force to handle and distribute them. They must be disposed of before they depreciate in value or before decay sets in. The same haste is not necessary in disposing of the more staple crops, such as grain, cotton, tobacco, and the like, nor is there half the expense involved in marketing them.

The first middleman. — The first men to make their appearance are those representing various shipping organizations of the country. Texas, for example, has no less than 200 such associations, that for years have been shipping to distant markets. These associations may have between them any where from ten to twenty distributors. These distributors are located in the leading markets, or gateways, leading to the principal cities in the East and North,—for example, St. Louis, Kansas City, Chicago and Pittsburgh. These cities are convenient diverting points and in each of them every distributor has a leading commission house. Every morning he is informed by telegraph of the market in each city in which he has such a commission house. Of course, the market report refers only to the goods he is handling. With all this information on his desk before him each day, he is in a position to distribute intelligently and to divert the cars to the best markets. The distributors watch every market large enough to take a carload and there are at least one hundred such accessible.

All states do not have distributing agents in the field, yet it is necessary for producers to employ some such means of avoiding the fearful losses that come through indiscriminate shipping. In the absence of distributors, a great deal of telegraphing to avoid glutted or broken markets is necessary. Moreover, the specialists who have had valuable experience in such work are generally two or three days nearer the markets than the distant shippers and are better equipped to divert cars when necessary.

The following actual instance will make the point clearer: A representative of three shipping sections was located in a certain town in Missouri through which passed three railroads. The trains that stopped at the junction represented twenty-five to thirty different shipping organizations in north Arkansas, southwest Missouri and Oklahoma. The distributor, representing the three sections, secured from the conductors the way-bills showing the destination of all the cars. He then changed the destination of some, seeing that some markets were getting double the amount needed while other markets were left unsupplied.

He found, in one instance, six cars of berries going to Des Moines, Ia., when one car would have been ample. He, therefore, cut out five of these cars for other markets and thus saved the shippers from great loss. If the six cars had gone on as originally billed, five would have had to be diverted after they had reached Des Moines. Much time would have been lost and the berries would finally have arrived at the market in a depreciated condition. Aside from the delay, there would have been the additional cost of higher freight charges, the cost of icing the cars and similar expenses. So, for example, through lack of intelligent distribution at the outset, one loss may follow another. The first middleman may be said, therefore, to bring results that are worth all they cost, which is usually about 5 per cent of the gross sales.

Second middleman. — This middleman is the regular commission merchant. He too must occasionally telegraph his patron to divert; or he may divert for him, with the owner's consent, when other markets promise better returns. As a rule, however, most cars are sold at their original destination and as soon as possible after arrival. Occasionally a car is sold on the track as soon as it arrives, for outside markets. Most of the produce received, however, is hauled on the street or to the store of the consignee. The greatest relief comes to the receiver through the liberal purchases of the third middleman.

The third middleman.— This class of dealers is known as jobbers, each of whom has a following of grocers, butchers, marketmen and other small dealers, many of whose orders are taken in advance and later delivered throughout the city to the purchasers. This class of jobbers includes many firms that fill orders for country towns. This order trade is considerable.

The jobbing trade purchases only good merchantable stock, so that finally the commission merchants or second middlemen have a considerable amount of stock to be disposed of. They are forced, therefore, to go to a different class of buyers, the peddlers, and "cheap Johns" as they are called, who go out into the poorer districts and sell as best they can at anywhere from 5 to 25 per cent profit. Sometimes they are obliged to sell at cost through force of competition or through the poor or damaged condition of the goods. Ten per cent is all that the third class of middlemen can safely figure on the average purchase.

The retailer, or fourth middleman.

It will readily be observed that the goods sent out by the producer pass through a great many hands before they reach the consumer. When such goods come to the jobber or third middleman they can hardly yet be said to have reached the consumer; there is another class of dealers through whose hands they must pass, namely, the retailers.

This class can not strictly be called a fourth class of middlemen, although in some respects they deserve the title. Strictly speaking, the jobber is the last of the middlemen, but since he cannot reach the average consumer, owing to the fact that he does not sell in small amounts, there is need for another class of intermediates.

This class sells directly to the private families and consumers in general, and it is in their sales that the margins arise that call forth the protests of the producing class. The question of retailers' profits is receiving a great deal of attention at present; the following extract from a paper of R. P. Wonnell, before the National League of Commission Merchants at Pittsburg, January, 1907, will make clearer the position of the three classes of middlemen and the retailers.

"The wholesale market for potatoes in Cleveland today is 38 to 40 cents per bushel, and the consumer, outside of a few districts, is paying the retailer from 70 to 80 cents for fractional parts thereof. Choice to fancy apples wholesaling at from \$2 to \$3 per barrel are retailed at from 7 to 10 cents per quart, or at a rate equal to \$6.50 to \$8 per barrel. Onions are dull at 45 to 50 cents per bushel and are retailing at from 75 to 90 cents. Eggs are wholesaling at from 25 to 28 cents for storage and fresh, and the consumer is paying 33 to 36 cents. And so I could go on down the list in much the same proportion, and prove to you sufficiently for all practical purposes, that the average retail grocer, is asking a margin out of all harmony with the condition of things.

"It is no longer policy to leave to the retailer the information that should reach the consumer; especially when we know it to be a fact,—and to the sorrow of all down the line,—that the man with the appetite and the money to appease it is often not thoroughly aware of the cheapness of things, until so informed by the cry of the "huckster," who is seldom, if ever, known to pay any one a profit.

"Retail values out of all harmony and proportion to the supply and to wholesale prices, are retarding the movement of apples, potatoes and onions in more cities than one.

"This restriction of consumption cannot necessarily be construed as an intention on the part of the retailer willfully to hold up consumption, but is rather an example of short-sightedness on his part, of a most pronounced character."

Retailers very often keep prices up because were they to lower them the public would be spoiled and would not buy when the market advanced. They contend also that the ordinary buyer does not figure on paying lower than five cents for any commodity. It happens, therefore, that a head of cabbage which could be sold at a profit for two cents is sold for five cents.

In defense of high prices the grocers often refer to bad debts and to the fact that a great deal of produce spoils on their hands. It must be admitted that there is some justice in this last argument and but little in the former. Bad debts are present in every business and must be accepted as a necessary evil. In the line that extends from the producer to the consumer, the retailer is the last man; if he receives more produce from the third middleman than he can sell, he sustains a loss. It is an impossibility to gauge what the trade in perishable goods will be for any day; therefore it is necessary to strike an average. Some days there will be a shortage and others a surplus of goods; in either case, the retailer, in this case a grocer, figures that he has lost something. It is his aim, therefore, to fix the price of this average quantity of goods so that it will yield him a steady profit during the season and equalize the fluctuations,—hence his high prices. This justification does not, however, extend to the staple articles.

Further in defense of the prices charged by retailers, the following points have been brought out from various sources:

(1) Butchers and grocers meet active competition from the hucksters and hawkers who go from door to door and sell at lower rates. The expenses of managing and keeping clean an attractive and sanitary store are heavy and it is, therefore, necessary to charge customers higher prices than made by the hucksters.

(2) The expenses of delivering goods and of keeping those that are perishable are considerable.

(3) The high prices which afford such big margins of profit are paid by the class that can afford to pay.

(4) The big margins are made on the minor perishable crops on which there is always some loss, and are made only in the season when the market is glutted or over-crowded.

The older commission merchants recall the time some twenty-five or thirty years ago when Gadsden, Tenn., then the leading shipping point in west Tennessee, organized and selected its own agent to go to St. Louis and sell its goods. The producers had objected to the 10 per cent commission of the commission merchants as being excessive. The results of this venture were such that it was never attempted again.

Conclusion.

The two sides of the problem of the middlemen have thus been touched upon. Briefly stated, the position of the middleman is that of being between two fires, the producer on the one hand, who wants the greatest returns from his produce, and the retailer or final distributor on the other, who endeavors to make the most from his trade. The valuable service rendered by all classes of middlemen in bringing the producer and consumer into better general contact or connection is likely to be overlooked and complaint made at what appears to be an unreasonable commission. Enough has been stated, it is hoped, to make it clear that in any case the middleman's work is difficult and perplexing enough and that he fairly earns any money that finally remains from his commission after the numerous expenses are subtracted. The producer and retailer have numerous problems it is true, but it is obviously unjust to make the middleman bear the responsibility for them.

The details that have been given are necessary to present properly the position the middleman occupies and the difficulties and many expenses inseparable from reaching the consumer. The whole subject affords legitimate theme for discussion among the various bodies of producers throughout the country. The growth of and additional expense connected with the labors of middlemen, are natural, and only keep pace with the steady growth and magnitude of the interests concerned or covered. [See discussion from another point of view by Morman, in this chapter, particularly the part on page 263].

SPECULATION AND FARM PRICES

By *John Franklin Crowell*

The speculative function in modern commerce performs several distinct services, some of which are universally recognized as legitimate, while others are frequently regarded as taking unjustifiable advantage of the producer or the consumer. Speculation does three things that the law of the land authorizes: (1) It assumes risks by the distribution of losses, as in the case of the insurance of life and property. (2) It advances funds to carry surplus stocks of staples during the period elapsing between their production and their consumption, including the accumulation of stocks, their warehousing, and their distribution to consumers at times and places at which the maximum price may be obtained for the existing supply at the existing demand. (3) It forecasts future values of agricultural staples as distinguished from actual handling of the staples themselves.

This second service works to the advantage of the producer by virtue of its realizing the utmost practicable value for the existing supply before another supply arrives to depress prices. The profits of distributive speculation of this sort are, in the long run, the normal competitive returns on capital, labor and ability enlisted in the timely disposal of surplus supplies. The same service works likewise to the advantage of the consumer, because of competing speculators each seeking to buy and dispose of his stocks within a given seasonal period.

Unless the producer or the consumer, or both, are prepared to assume these hazards of distribution, they will continue to be performed by some distinct class of people whose individual aptitudes enable them to command capital in the performance of this service, which neither the producer nor the consumer could undertake without said service costing them and the public more than it does under the existing division of labor. If the rewards of speculative distribution become excessive, competition among speculators will, in the long run, reduce it to something near the normal rate of returns for similar services.

The third speculative service is the key to the world's market. The world's grain and cotton crops are largely gathered and stored within a harvest period of four months. To carry these stored stocks in warehouses is one piece of speculative work; to fortell with reasonable accuracy what the value of the balance of this season's and the next season's supplies will be for each of the remaining eight months of the year and beyond, is quite another function. In fact, of the two services, warehousing for a higher price and forecasting values of supplies present and prospective, the latter is by far the more fundamental of the two. In actual commerce, it is the forecasting of future values on the bases of harvest prospects, existing supplies and the business outlook, that largely influences the price at which the holder of surplus stocks or the producer of the next harvest undertakes to supply the consumer.

Shall speculation in future supplies of farm staples be forbidden as injurious to the producer or consumer, and thus against public policy? The Supreme Court of the United States has decided (Bibb vs. Allen & Co.) that speculation in futures is not gambling, but that, on the contrary, it has become so fully incorporated with the ordinary operations of industry and trade as to be incapable of eradication without impairing the entire productive system of modern enterprise. The cotton-future contract, for example, creates credit from one end of the world to the other by the parties thereto assuming the risks involved in the growing of the crop, making certain a world-wide market for the entire crop at a fairly definite value, months in advance of its production.

Hedging.

Among the uses of future contracts, that known as "hedging" is most intimately related to the manufacturing industry. Seventy-five per cent of the New York cotton-exchange business is hedging. In grain speculation, hedging by consumers plays a large rôle. A manufacturer of flour, for instance, makes a contract to deliver 1,000 barrels of flour a month throughout the year. Without the existence of exchanges where future contracts are bought and sold in large quantities, he could not anticipate what wheat would be worth ten months hence. He finds a class of traders in future contracts who make a business of doing this. This concourse of buyers and sellers of future contracts represents the competitive judgment of the world as to the most probable level of future values. The miller bases his future costs of producing flour on this estimate, and thus makes sure against loss by buying future contracts in wheat and selling flour on that basis, or as much better as he can. Probably the greater part of manufacturing contracts are based on such future agreements to deliver cotton or grain. The consuming demand of both staples would be greatly restricted if such agreements were prohibited. As the practice runs now, thousands of manufacturers bid as buyers months in advance for them and thus enhance their value to the producer.

Short selling.

These buyers necessarily meet sellers—sellers who have not the commodity but expect in the interim to buy at a lower price what they now sell for future delivery. This is what is known as short selling—a practice whose commercial morality has been most widely questioned. The short seller is accused of beating down prices. It is true the short seller believes that the crops in question will be large enough or the demand small enough to justify his forecast of lower prices. His interest coincides with the consuming side of the market, in opposition to the holder of cotton or grain who wants higher prices on which to sell his holdings.

The results.

Thus, both the consuming and the producing interests in the world's great staple markets are each represented by speculative groups, the first resultant of whose efforts is to eliminate wide fluctuations from the market. Speculative dealings in futures act as a balance-wheel. But for them, prices in years of scarcity would be much higher and in plenteous years much lower, to the injury of both the producer and consumer. If the short seller is eliminated, the market is placed either at the mercy of the producer or the speculative buyer, and the manufacturer and consumer have no speculative representation in the play of the forces of supply and demand. If the short interest proves to have made the more correct forecast of the course of prices, he gets his gains. If he is mistaken, he becomes a buyer at higher prices, raises prices and takes his loss. In both events, he represents a normally necessary factor in the constitution of the modern market. As such, his operations in the long run make for all-round justice rather than the contrary.

Speculation evidently cannot be regarded as an organized attempt to depress prices to producers. Even a "corner" favors the producer by higher prices, which the short seller helps to make in buying to fill contracts. The reason for this is that every short seller of futures must sooner or later, to fulfil his contract, become a buyer. This tends to raise prices for spot delivery and to that extent favors the producer. Furthermore, the producer is aided by the buying of future contracts. As a matter of fact, future sales are generally a little above spot prices in order to meet the carrying and other charges for the period involved. These and other considerations lead to the conclusion that under the speculative system, by which surplus crops are disposed of at the times and places of their maximum value, the producer must get all the larger returns and the consumer a better service, because of such a system rather than by any other method which has been in use.

In comparison of the spot and future prices of wheat at Chicago as shown in the report of the Industrial Commission (Vol. VI, pages 223–324), in four cases out of five the speculative price proved to be higher than the cash price of wheat at the expiration of the July-October contract. In comparison of the July bids for October futures with the October spot prices actually realized, the spot prices were lower than the future bids in nine cases out of fifteen, and higher in six cases out of fifteen. As a rule, the cash prices tend to fall below the speculative bids in both Chicago and Liverpool. The same authority (Vol. VI, page 213), in the matter of cotton, says: "These results would seem to support the conclusion that in the long run the speculative quotations for future delivery are neither uniformly above nor below the level of the proper cash value, as determined at the future date, but that they are tentative anticipations of such realizable value as the conditions of supply and demand are most likely to determine at the time when the future contract matures."

Literature.

H. C. Emery, On Speculation; Rollin E. Smith, World's Wheat Fields and Markets; Reports of Industrial Commission, 1900, Vol. VI, pp. 5-35; Hadley's Economics, Chap. IV; Reports of Bureau of Corporations on Cotton Exchanges, 1908.

DISTRIBUTION AND SALE OF PERISHABLE CROP PRODUCTS

By *J. H. Bawden*

The two essentials to the fruit- and truck-growers of this continent in securing satisfactory returns for their products are: (1) Quick transportation and proper refrigeration; (2) thorough and general distribution. The great trunk-lines of the country have all developed in the last ten years a very efficient fast freight schedule, from the most important growing districts to the large consuming markets. At certain seasons, however, especially during a time of enormous crop movement, as in the winter of 1906-7, the congestion paralyzes the motive power of railroads, and the loss to growers and shippers of perishables is tremendous. It seems that the only way to remedy this evil would be to have the railroads run straight trains of perishables on fast-express schedule, and not to attach cars of fruit and similar products to trains of regular merchandise freight, as is the custom at present. However, they will probably do this only under compulsion, as it would incur increased expense in motive power.

In the past, the fruit business of the United States has been dominated by the private-car line and, therefore, oppressed by the rebate system and all the evils that monopoly, exclusive contract, and the like, carry with them.

The private-car line companies were, no doubt, the life-preservers of the infant fruit-growing industries of the continent. The remarkable history of their growth, in a few years, from comparatively small, original investments to million-dollar corporations, is a good criterion of the wonderful development and increase of fruit-growing areas. The private-car line sent its agents (and does today) into the growing centers to aid the shippers by advice, practical instruction, often advancing them money and assisting them in every possible way to get their crop to market. The toll they exacted for such service, however, was, in the main, extortionate. So much unfavorable sentiment was aroused against them for this reason that now most of the roads own and operate their own refrigerator cars and are giving better refrigeration service at much lower cost.

There has been very little improvement in the method of refrigerating, except in the way of increased facilities and also in a number of different devices for pre-cooling cars of fruit at loading stations, thereby maintaining a more even temperature and lessening the consumption of ice en route. All of these devices are in practical operation in California.

The railways have their agents report on these refrigerator cars regularly and the bunkers are kept full of ice from shipping point to destination. It does not seem probable now that any other method but ordinary ice-refrigeration will ever be used in fruit-carrying. The only improvements that might be suggested are a lower tariff and, as stated before, express-time service for straight trains of refrigerator cars on main trunk-lines.

Transportation and distribution.

The problems of transportation and distribution are so correlated that one merges into the other. Most of the railways realize this, and some of them have established rules, ways and means to assist the shipper in disposing of his fruit, vegetables, and other produce after they reach the markets. The Pennsylvania railroad, for example, has established one of the finest delivery yards in the country for the convenience of Pittsburg produce and commission merchants. This yard will hold several hundred cars, and is systematically divided into separate sections, one for all the leading varieties of fruits and produce, each section having track room for a certain fixed number of cars. When any one of these sections becomes filled, and the prospects are for a glutted market and ruinous prices, the Pittsburgh agent wires the agents at connecting lines where such fruit or produce is likely to be transferred from other roads, not to accept any more cars until the tracks clean up and the embargo is lifted. In this way, they protect the shipper against heavy loss and themselves against having cars refused by receivers who will not pay the freight because they may not realize even the amount of the freight on the over-stocked market.

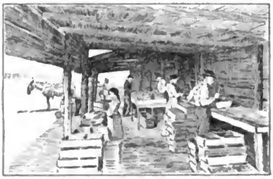


Fig. 66. Type of packing shed found on many small fruit-farms in the Southwest.

The railways can, and do, greatly facilitate the distribution of car lots to the various markets by their diversion scheme, by which cars may be transferred on a fixed tariff from one railway system to another, thus enabling a shipper to move his car on, in case of congestion, to some better market. California roads make a flat or portage stamp-rate on all citrus fruits from the coast to all points from the Rockies east to the Atlantic, and cars can be diverted readily except in the extreme southeastern territory.

Auctions.

Another way in which railroads are coöperating in distribution, is by placing at the disposal of shippers in all the big markets, immense floor space in their freight depots for unloading cars of fruit and similar produce that is to be sold at auction. This is the modern, rapid, effective way to distribute fruits and produce thoroughly in large cities. Wherever an auction has been opened, the consumption of the products sold therein has increased 100 per cent every few years. The auctions are all run on an open basis, that is, any one who can pay for goods, be he great or small, Italian or Greek, Jew or Irish peddler, is entitled to bid.

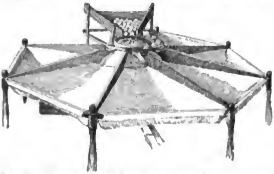


Fig. 67. The Maull and Jones pneumatic sizer. A device used in grading citrus fruits.

The largest, most intelligent and successful of all fruit-growing organizations in America, such as the California Fruit Growers' Exchange (page 265), the California Fruit Distributors, and the Grand Junction Fruit Growers' Exchange, sell their shipments through auctions whenever it is possible. There are auction companies operating in New York, Boston, Baltimore, Pittsburg, Philadelphia, New Orleans, Cleveland, Cincinnati, St. Louis, Chicago and San Francisco. In New York alone, three large companies will handle a volume of from $40,000,000 to $50,000,000 of business a year.

Experience shows that the auction method is the only logical one in all cities of 200,000 population and over. By the auction method, fruit can be sold at the lowest possible expense, direct from cars, under the supervision of the grower's agent, thus eliminating the expense of broker and middleman or jobber. The auction is patronized by the army of small dealers and peddlers who load their purchases in wagons and sell direct to the consumer or to the retailer. The growers' associations are beginning to realize what a great opportunity auctions afford them to dispose of their shipments at the lowest possible actual expense.

Growers' organizations. [Cf. the last two articles in this chapter.]

The solution of the question of distribution, however, depends on organization, principally among growers and shippers. The example of the California Fruit Growers' Exchange, which has grown from a nucleus of a few coöperative enthusiasts early in the decade of 1890, to control the marketing of 60 per cent of the California citrus fruit crop, ought to be inspiration to growers all over the country. There should be intelligent and thorough national organizations of apple-growers, of peach-growers, of potato-growers, and the like. These organizations must be something more than merely yearly social gatherings where papers are read and topics of interest are discussed. They should be thorough, permanent business organizations, with a bureau ready to furnish accurate crop statistics for every growing locality, and some well-defined marketing scheme to embrace the entire country.

The number of small coöperative growers' associations formed in the past five years has been remarkable, and the benefits the members have achieved in a small way ought to make the work of national organization easy when the evolution of the coöperative movement has reached that stage. Of course, human nature, which is in the main selfish and bigoted, may prevent some growers and shippers of apples in one section from joining hands with apple-growers and shippers from another. But there are today men, both in Canada and the United States, with clear minds and strong imaginations who can forget petty prejudice and who are endeavoring to put the apple commerce on a basis where it will be a safe, sane business proposition for all concerned.

Growers' associations and the jobber.

In discussing the matter of distribution, the jobber and commission merchant are entitled to much consideration. While the grower, in the past five years, has been aroused to a sense of the great value of organization, and consequently has been in a position to stand pat on his f. o. b. price, the jobbers have waged war against one another to such an extent that they have paid any price the growers' association saw fit to ask for stuff and often incurred heavy losses by so doing. On the whole, the growers of all kinds of fruits and produce in this country have received very large prices

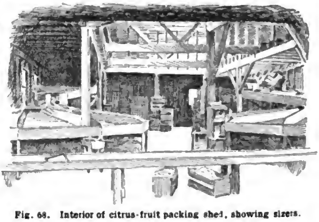


Fig. 68. Interior of citrus-fruit packing shed, showing sizers.

for the past four years and the credit for this is due chiefly to their many strong coöperative associations. To offset the increasing hold of these growers' association on distribution, a number of jobbers in the larger cities have bonded together in pool companies, and with the force of their united buying and selling power some of them have been able to make very favorable contracts with important growers' associations for the disposal of their shipments.

It is certain that if the jobber, who still retains in his hands the machinery of distribution to the retailer, does not organize and adapt himself to the changes that evolution is bringing about in his business, he will be crushed out by the direct agent of the growers' association.

Preventable losses.

One phase of the situation in which there must be radical change effected is in the enormous loss through decay and shrinkage in perishables after they are unloaded from cars and exposed for sale. In all cities of any consequence, thousands of dollars worth of fruit is daily hauled to the dump, because the seller was too short-sighted to take a fair price, when it was offered. It is shameful to allow such waste, and a sad reflection on our intelligence that such a condition of affairs should exist.

One way to avoid this loss would be for merchants to sort out, at a certain specified time every day, say 3 P.M, all their weak lots of fruit and have them disposed of at auction. They would be purchased by a class of peddlers who would place them immediately in the hands of consumers, and the grower would get some return on them. As it is, under the present disordered system, the consumer must pay too high for the good quality and well-conditioned fruit that he buys. He is made to pay the jobber for what has rotted on his hands.

Packing. [See Vol. II, p. 355.]

One of the chief factors in the successful distribution of fruits is the manner of grading, packing and boxing. California has set an example to the world in the conformity of grading and packing, and in the neat, attractive packages in which the fruit is shipped. Buyers like a brand that is always up to grade. Many consumers have been known to pay a dollar a box more for favorite brands than for others not so well established, but which were worth approximately as much.

In the apple business, the box has almost revolutionized the trade, and for packing fancy stock it will very likely supersede the barrel. The box tends to increase home consumption, inasmuch as one might buy a bushel for family use when a barrel would constitute an over-stock.

What needs to be done.

The weakest spot in the whole scheme of transportation and distribution is not with the grower nor with the railroads, but rather with the jobber and commission merchant on whose shoulders falls the burden of distributing in the large markets under the present system. It is not reasonable to suppose that merchants, each one individually anxious to corner the market on some particular line of fruit or produce, are going to take the interest of the grower very much into consideration. They are all business competitors, each one imagining he is a little shrewder than the other and endeavoring to instil this fact into the minds of the men from whom he draws his supplies. It can be easily understood, therefore, that, since no one of these merchants takes the other into his confidence, it is altogether probable that a glutted market may often result from their united, though unorganized, action. If, in all large markets, the men who are vitally interested in the process of distribution would organize an exchange and report all car-lot quotations, shipments, and the like, direct to this exchange and have them passed on by an advisory committee with power to regulate purchases and consignments, it would be impossible to flood the market with such an over-abundance of any articles that disaster would be the certain result for all concerned.

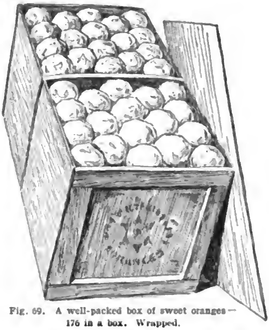


Fig. 69. A well-packed box of sweet oranges — 176 in a box. Wrapped.

In a country as vast as North America, which grows almost every variety of fruit, with the exception of those thoroughly tropical, the possibilities for immense development of the industry are almost beyond comprehension. If the men who are interested in the growing, handling and distributing of similar material will bring to bear upon the enterprise the same amount of care, intelligence and concerted action that has built up great corporations, the rewards will be great and the business will be on a solid basis. However, if the present disorder and chaotic system of competition prevails, each man working blindly against his competitor, each locality striving to outdo some other locality in the matter of production, any increase in the growing areas, and in the capital invested in the same, will produce ruinous results.

INFLUENCE OF PRECOOLING ON TRANSPORTATION OF FRUIT

By *Wm. A. Taylor*

In the earlier stages of the development of refrigerator-car transportation for fruits and produce, comparatively little attention was paid to the condition of the product when it entered the car for shipment. Just as in the early history of the cold-storage of similar produce, there was a strong tendency to ignore other factors affecting the soundness, longevity and wholesomeness of the product and place chief dependence on the preservative effect of the low temperature produced by the melting ice with which the cooling of the cars was done in transit. Warm fruit was loaded into the iced cars, which were then started on their journey. As the ice in the tanks was melted by the heat of the fruit, it was replaced by new ice from icing stations located at convenient intervals along the main routes over which fruit was transported. If the ice capacity of the car was large and the supply was replenished with sufficient promptness, the product ultimately reached a temperature suitable for the preservation of the fruit, but in actual practice a considerable variation in behavior of produce thus transported was experienced. Fruit loaded in warm weather was found to show much more deterioration in transit than such as had been packed on cool, dry days, and that in the upper tiers of packages in the car was found to be much riper and worse infected with molds and other rot fungi than the fruit in the tiers in the bottom of the car.

An early recognition of the difficulty of fruit transportation under refrigeration.

The experience of Mr. Parker Earle, one of the pioneers in the development of iced-car transportation of fruits, as recorded by himself, illustrates the early recognition of the difficulty.[1]

"The first attempt at carrying carloads of strawberries under refrigeration was made by Mr. Davis, of Detroit, about 1868. He came to Cobden with a car that was made for refrigerating beef and fish. It contained a vertical cylinder in each corner of the car about fifteen inches in diameter, and was iced from the top of the car, using salt with the ice. The consequence was the freezing of a part of the berries, while the balance of the load was very unequally cooled. The result was a loss which did not invite a repetition of the venture.

"The experiment interested me greatly, and I thought I saw why it failed—that the refrigeration was very unequal and in parts very excessive. The following year I got a car from the Michigan Central Railway Company that was built to carry dairy products. It was loaded with berries by an association of growers at Cobden. It held about a ton of ice in each end. I went ahead to Detroit to make sure of a market and the car was loaded by the growers. With this half charge of ice the berries might have gone through in fair condition but for the misfortune that some railroad man took out the plugs from the ice boxes in the roof to give the berries 'a chance for a little air,' and left them out. Of course the ice was melted in a day and the bulk of the cargo was ruined. This discouraged community efforts in this line at that time. I, however, began experimenting with our own berries by building a cooling box in our packing shed at Anna, Ill., and holding the berries in it twenty-four hours to cool off and then sending them by express. It was found that those so cooled went into Chicago in better condition than those freshly picked from the field, although they were one day older. Repeated experiments served to establish this fact. This decided my plans. I went to Chicago and engaged the best refrigerator car then made—the old Tiffany patent—with ice box, V-shaped, suspended from the roof and running the full length of the car. The utmost capacity of this ice pan was one and one-half tons. I knew well that this quantity would not both cool off a load of berries and keep it cool for two or three days, so I built a cooling house at Anna large enough to hold ten tons of strawberries and I cooled the load down for a day in that house and then transferred it to the Tiffany car. The berries went into the cars at about 50° Fahr. The result was a complete success from the start. No such solid, good-keeping berries had ever been seen in Chicago. I enlarged this cooling house at Anna, built one at Villa Ridge, and another at Cobden. For several years we handled our own berries and other fruits and much that we bought with very good success. I think this first successful car was sent in 1872."

Notwithstanding this early perception of the importance of quick cooling, little attention was paid to the matter during the rapid expansion and use of long-distance transportation facilities which occurred from 1890 to 1900, practically all fruit being loaded into the cars warm, or at least without any special effort to insure uniformity of temperature previous to the loading.

Investigations of the United States Department of Agriculture.

The investigation of some of the difficulties involved in fruit-storage, which was begun in the United States Department of Agriculture in 1901, soon disclosed the necessity of promptly checking the ripening processes and preventing the growth of destructive fungi by the quick cooling after harvesting of fruit destined for prolonged preservation in its natural condition. Experimental studies of the storage of peaches in Georgia, pears in New York, Maryland and Delaware, and apples in several of the eastern states established beyond question the correctness of this principle.

Observation of the temperatures of peaches in different parts of refrigerator cars in transit from Georgia, where the general practice was to load the cars with peaches packed in carriers, five tiers high, showed that the fruit frequently went into the car at a temperature of 75° to 90° Fahr. With the best available re-icing service the temperature of such fruit in the bottom of the car was found gradually to drop to 40° to 50° Fahr. in two to five days after loading. The temperature of the fruit in the top tiers at the same time was sometimes 10° to 15° higher. In such cases it not infrequently occurred that while the fruit in the bottom of the car arrived sound and in fact could be carried in good condition several days longer, that in the top tiers showed 5 to 30 per cent of decayed specimens. The condition of the fruit in the upper tiers in the car, therefore, determined in large degree the area over which the crop could be distributed. As any marked increase in the relative ice capacity of the car appears impracticable from economic reasons, such increase involving a disproportionate increase in cost of equipment and in dead weight which would tend materially to increase the cost of transportation, the most promising remedy at the present time is the cooling of the produce before loading it into the car. In the investigations by the Department of Agriculture this practice has been termed precooling. It is identical in principle with the quick cooling that has been found essential to the long-keeping of fruit in storage, the beneficial effect in both instances resulting from the checking of the ripening processes and retarding the development of destructive fungi.

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[1] Yearbook Department of Agriculture, 1900, pp. 444–445.

Up to the present time, the chief dependence of the long-distance shipper of perishable fruits has been the harvesting and shipment of the product in an immature condition to reduce the risk of over-ripeness of a considerable part of the car-load. This has resulted in the placing of much unwholesome, unripe fruit on the market, with resultant restricted consumption and unsatisfactory prices. Recent tests have shown the entire practicability of transporting hard—ripe peaches from California to the Atlantic seaboard in sound, palatable and wholesome condition by precooling the packed fruit to a temperature of 40° to 50° and then forwarding it under the regular icing service; and within reasonable limits the same principle appears applicable to most kinds of perishable produce.

While the soundness of the principle of precooling has been proved, little extensive application of it to the handling of deciduous fruits has yet been made. Cooling facilities in close proximity to orchards and small-fruit plantations are as yet lacking or at best inadequate for the precooling of any considerable quantity of fruit. More experience has been had in the precooling of oranges in California than with any other fruit, about three hundred car-loads having been thus treated in 1907 and a large quantity in 1908.

Experiments in precooling oranges.

The results of a large number of experimental and commercial shipments of precooled oranges from California in the season of 1906-7, were thus summarized by Powell:[1]

"The ripening processes in citrus fruits proceed so slowly and are of such a nature that it is not necessary to ice the cars to retard the ripening even with ripe fruit in hot weather. The citrus fruits are iced primarily to retard the development of decay and secondarily to retain the fresh appearance of the fruit on arrival in market by preventing undue evaporation from the skin during the trip. A carload of oranges under refrigeration cools down slowly, as each orange is partly insulated in the paper wrapper. The loose ends of the wrappers make a layer of paper between the rows of oranges, and the fruit is packed so firmly that this prevents a free circulation of cold air around each orange. The cooling is done by conduction of heat from orange to orange and to the air surrounding the packages. In warm weather a car of fruit often covers from one-fourth to one-third of the trip across the continent before the temperature of the oranges drops to 50° Fahr. The fruit, therefore, may decay during the first part of the trip if it has been handled in such a way as to make it susceptible to decay, especially if it is not shipped promptly after picking and packing. If it is shipped promptly it does not decay excessively except in hot weather. The icing of the fruit retards the development of decay temporarily. It transfers the decay from the shipper to the receiver. It does not affect the shipping quality, except the general appearance, or the keeping quality of sound oranges, but it is a means of overcoming for the time being the bad effect of handling the fruit improperly in the groves and packing-houses.

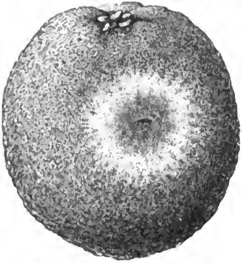

Fig. 70. Washington Navel orange, showing blue-mold decay.

THE COOLING OF ORANGES BEFORE TRANSPORTATION

"The cooling of the orange before shipment insures less decay in transit in poorly handled fruit, as the fruit is started in a cold rather than a warm condition. The fruit arrives in sounder condition, but the oranges that might have decayed in transit under ventilation or ordinary icing decay after the fruit is removed to a warm temperature unless it passes quickly into consumption.

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[1] B. P. I. Bul. No. 123, Mch. 31, 1908, pp. 52-55.

Icing or precooling used primarily to overcome the effect of improper methods of handling in the groves and packing houses should be severely condemned, as it is a means of deceiving the purchaser who buys fruit that is apparently sound only to find the decay developing as soon as the fruit is removed to a warm temperature.

"The use of icing or of precooling as a means of overcoming losses that the grower and shipper can not prevent in the ordinary course of business is commendable and is essential in the handling of most of the orange crop in California in warm weather.

"The precooling of citrus fruits is worthy of consideration from other points of view. It appears to be possible to save ice in transit by loading the fruit in a cold rather than a hot condition, and it seems to make it possible to increase the freight-carrying capacity of a car if the fruit is properly cooled, without increasing the probability of decay. Theoretically the heat withdrawn in reducing a carload of 384 boxes of oranges from 70° to 40° Fahr., is equivalent to the melting of about 2.6 tons of ice. The rest of the ice used in transit is consumed in protecting the fruit against the heat that comes in through the car and in cooling the car itself. The cars, however, have to be iced before loading when cold fruit is shipped in them, a practice that is not followed under ordinary icing. The saving of ice in precooled fruit when the cars are re-iced as often as they are under ordinary icing is slight and does not appear to be of practical importance. The saving comes, however, from the fact that it does not seem necessary to re-ice precooled fruit during the first part of the trip as often as it is done in ordinary icing. In the shipments in which the temperatures in the cars have been under observation during the transcontinental trip, the temperature of the fruit cooled to 35° and 40° Fahr. has not begun to rise, even in hot weather, until a third or a half of the transcontinental trip has been covered, while in cooler weather the cars have covered the entire trip to New York without a detrimental rise in temperature, often arriving with at least a ton of ice in the bunkers. Under regular icing the cars are re-iced six or eight times during a transcontinental trip.

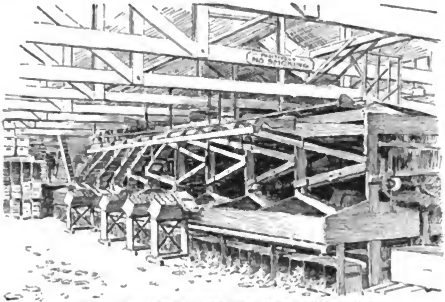

Fig. 71. Orange packing house, with overhead sizing machines.

"It is not intended to draw conclusions from the data at hand as to the effect of precooling as a means of saving ice, but rather to present a limited amount of data to show that this phase of the subject is worthy of careful consideration on the part of shippers and transportation companies.

"The second point worthy of consideration is the possible increase in the freight-carrying capacity of a car when loaded with fruit that has been cooled properly for shipment. Under the present method of shipment, the minimum freight weight of a carload of perishable produce is established not by the actual carrying capacity of the car, but by the height to which it is safe to load the car without excessive decay in the top tier or tiers of fruit and by the spacing between the packages that it is necessary to leave for a free circulation of air.

"In the experimental shipments of the Bureau of Plant Industry, a number of forty-foot cars have been forwarded with 549 instead of 384 boxes, the latter number being a standard load under ordinary icing. The increase has been accomplished by loading the cars seven rows of boxes wide, leaving all of the space next to the walls of the car, and three tiers high, the upper tier being laid on the side, instead of six rows wide and two tiers high, as loaded under ordinary icing. In hot weather, the cars can be loaded two tiers high and seven rows wide, making 448 boxes. In the first case the capacity of the car is increased 165 boxes, or 11,880 pounds, and in the second case 64 boxes, or 4,608 pounds. In a train of thirty cars the load is increased 356,400 pounds in the first case or 138,240 pounds in the second without adding dead weight to be hauled in the form of extra cars.

"This phase of the subject seems worthy of careful consideration on the part of shippers and transportation companies, especially in a time of car shortage.

Summary of Precooling Records

"The substance of the records under precooling demonstrates that the temperature remains fairly constant in fruit that has been cooled and is forwarded in a car iced before loading and iced regularly in transit; that the temperature of fruit cooled to about 40° Fahr., forwarded in a car iced before loading, and re-iced at San Bernardino, Cal., only, remains fairly constant for at least half of the transcontinental trip, when the temperature may begin to rise if the weather is warm; that it may be safe to ship oranges cooled to about 40° Fahr., to points in the western half of the United States with California icing only, provided the time in transit is normal; that the fruit may be shipped across the continent in reasonably cool weather when handled under the preceding conditions; that the need of re-icing in transit would probably have to be governed by the quantity of ice remaining in the bunkers at any point and not by a predetermined fixed rule, and that it is not safe to load cold fruit in a warm car and forward it without icing."

Practical difficulties in cooling produce for transportation.

There are many practical difficulties in applying the precooling principle. In contrasting horticultural products with meat products, the latter being universally cooled before shipment, and in discussing the relation of the improvement in the method of handling horticultural produce to the extension of markets and the difficulties in cooling produce for transportation, Powell had the following to say before the First International Congress of the Refrigerating Industries (October, 1908):

"The conditions surrounding the handling of horticultural products are entirely different. Horticulture is a more precarious business. The shipments are not as certain. They depend more upon the elements and the seasons. The shipping period is not continuous, as it is in the shipment of meat. Fruits and vegetables are grown by a large number of persons scattered over wide areas. In the early days of American horticulture there were few sections that produced a carload a day during the shipping season. It is only in recent years that 150 cars have been shipped in a single day from a station, or from five hundred to several thousand cars from one locality during the season. There naturally grew up in the early days of American horticulture the present system of loading horticultural products directly from the fields and packing-house, as it was not practical to build and operate refrigerating plants in which to cool the products before shipment.

"There have been sufficient data presented in the preceding discussion to indicate the possibility of extending the markets in horticultural products. There is abundant evidence to show that a careful preparation of the fruit for market, together with cooling to about 40° Fahr. quickly after picking and packing, would more than double the area over which fruits such as the peach, apricot, cherry and the small fruits are now distributed.

"The question naturally arises, is it practical to modify the present methods of handling and of shipping horticultural products under refrigeration? From the standpoint of the handling of produce, it can be said that a gradual improvement is taking place in this regard all over the United States. It is a question of business management, of the handling of labor, of better appliances for the handling of fruits and vegetables in the fields and packing-houses, and of a knowledge of the relation of the care with which they are handled to the development of diseases.

"From the standpoint of refrigeration in transportation, the problem is more complicated and has not yet passed the experimental stage. Stated broadly, the cooling of large volumes of horticultural produce required that each shipper or an association of shippers, or some agency such as a transportation or warehouse company acting for them, shall erect cooling plants at shipping-stations or at assembling-points where the products may be properly cooled before shipment. The cooling may be done in a warehouse, or, if practicable, after the produce is loaded for shipment by circulating cold air through the cars.

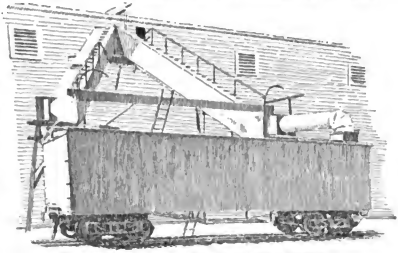
Fig. 72. The cooling of oranges in cars before shipment.

"Following the experimental investigations of the Bureau of Plant Industry along these lines, a number of plants have been erected by shippers in different parts of the United States, a number of patents have been issued within two years covering devices designed to accomplish the rapid refrigeration of produce in cars or in warehouses; and the question is receiving consideration by railroads, especially by those that transport the fruits and vegetables from the western part of the United States.

"In California, large volumes of produce are shipped daily during the season from single sections or from stations in close proximity, and there are a few assembling points in the state where the cars are made up in trains for shipment from the state. The question suggested under such conditions is the practicability of cooling train loads of produce by circulating cold air through the cars at the large shipping-stations or assembling-points, without interfering unduly with traffic. To the solution of this problem, the Southern Pacific Company and the Santa Fe System are giving experimental consideration.

"Another problem which is suggested in sections where a number of shippers are closely located is the practicability of delivering the refrigerant from a central plant to cooling-rooms located in each packing-house."

"No one who has considered the tendencies in the development of commercial horticulture, and the evolution of the methods of transportation during the last quarter of a century can doubt that both the methods of handling the products and of transportation will continue to improve as the industry expands. No one can doubt that commercial horticulture will rapidly expand, both in the areas of production and of distribution, when the most careful handling is applied in the preparation of the products for shipment and when the methods of refrigeration make it possible to distribute them in a sound wholesome condition to the most distant markets of the world."

The outlook.

The determination of how best and most economically to precool fruit yet remains to be worked out. The cooling of the fruit in chilled rooms either before or after packing for shipment is doubtless most efficient wherever suitable facilities are available or the volume and duration of the shipments justify the construction of plants for this purpose. Two coöperative orange packing-houses in California have recently been equipped with cooling rooms for this purpose, one of these furnishing ice for the initial icing of the cars also. Space in cold-storage warehouses in the nearby cities is utilized for the same purpose, and most of the experience thus far is with fruit handled in this way.

The manifest desirability from the economic standpoint of cooling the fruit in the loaded cars at important shipping or concentration points has aroused much interest in the practicability of cooling carloads of fruit by forcing cold air through them as they stand on track. The initial work along this line was done by the Bureau of Plant Industry at Los Angeles, Cal., in 1905 and continued in 1907, and projects having this in view on a large scale are under construction in California by the transcontinental railroad lines. Much experimental work yet remains to be done before the economic efficiency of the practice can be determined and the extent of its practicability under the varying conditions of different regions settled.

The principle of precooling is apparently destined to play a very important part in the long-distance transportation of fruit both to domestic and foreign markets, but it must always remain secondary in importance to careful handling of the product. While precooling may serve to retard the development of rots in fruit that has been roughly or carelessly handled, such fruit deteriorates rapidly on exposure to high temperatures.

INFLUENCE OF TRANSPORTATION ON AGRICULTURAL INTERESTS, AS ILLUSTRATED IN THE TRUCK-CROPS.

By *L. C. Corbett*

The transportation of truck crops involves two distinct features: First, the carrying of such products to the market; second, the extension of the trucking area. The first problem demands a consideration of the methods of harvesting, packing and shipment of truck crops; the second, the extension of old and the development of new areas. We will consider the second of the points first. Transportation facilities have made the trucking business possible, and the two together have made the great centers of population possible by providing facilities for feeding such aggregations of people.

Transportation as related to the development of the trucking industry.

Transportation facilities have extended the country tributary to the great markets from the limits of the wagon haul to beyond the confines of the national boundary. They have extended the culture of garden vegetables from a zone of twenty-five miles about each city, with its intensive market-gardening and greenhouse industries, to limits of the range of climatic influence of the hemisphere. Quick transportation facilities, together with careful handling and refrigeration, enable producers, located in regions remote from the market, to take advantage of the natural climatic conditions of the region to grow products in the open which could not be produced in the wagon zone about the cities, except by employing greenhouse facilities. Transportation has built up the trucking industry, which, as compared with market-gardening, is an extensive industry, market-gardening being one of the highest types of intensive horticulture. These changes in the character of the industry have had the effect of making many crops which formerly had a restricted season almost perennial in the market. Field-grown lettuce is to be found in the markets throughout nearly the whole year. The same is true of tomatoes, beets, peas, string beans and other short-season annuals, which, before transportation joined the crop zones of Maine and Florida, had restricted market seasons determined by the climatic conditions of the area immediately tributary to the market.

Still another important result which is rapidly developing under present conditions, and which is to be attributed largely to transportation, is specialization among growers. This is more apparent among truck-growers than among market-gardeners. There are these who make a special feature of strawberries, asparagus, tomatoes, cabbage, kale, and the like, and give little attention to other crops.

Extensive operations in regions remote from the market are encouraged by the savings resulting from shipping in carload lots. Such savings are much greater on long-distance shipments than on local shipments; in fact, many of the prosperous trucking communities now existing could not thrive were the producers obliged to ship independently and by local freight or express. Coöperative production and shipment, in regions possessing the advantages of soil and climate which allow them to command the markets for a limited period each year, enable small producers to market their products to advantage. The advantage to growers in remote regions of carload shipments is often used as an argument to induce local shippers close to market to combine for the purpose of shipping in like manner. The small grower located in a region remote from market is obliged to coöperate with others of his kind in self-defense. Car-lot shipments from such regions are the grower's only means of existence. The result is coöperation among small growers or extensive production by individuals or corporations.

The coöperative shipping arrangements carried out by the winter truck-growers of southwestern Texas is a notable example of the good results to be obtained from such combination. The extensive production of individual growers at various points along the Atlantic coast, notably Charleston, Norfolk and Wilmington, prove the advantages of carload shipment from these regions. The corporation operating in cabbage and potatoes on Young's Island, S. C., attests the advantages of extensive specialized industries. This firm alone produced in 1905 a head of cabbage for every inhabitant of the nation.

Transportation as related to harvesting and packing.

The great distance covered, together with the long time and the changes in climate to which perishable products are subjected in transit, has rendered it necessary to develop certain types of packages to meet these conditions. The style of package is determined by the character and value of the product. Strawberries go down so quickly under certain conditions that, in order to transport them successfully, the fruits must be carefully selected and graded, packed in quart cups made of wood and these arranged firmly in a compartment of the shipping case provided with division slats to separate one tier of boxes from another. As soon as the fruit is picked, it is placed in a shaded, airy place to cool as rapidly and completely as possible before assorting and packing. After the storage space has been filled, the ice pan is placed in position and filled with ice, to reduce the temperature in the fruit. Before the carrier is placed on the train for shipment, the ice is replenished so that the temperature inside the case shall remain practically constant during shipment. This is the most expensive carrier of the type used for truck crops.

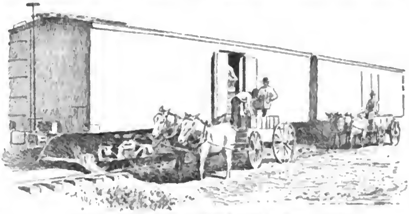

Fig. 73. Loading cars on a sidetrack with tomatoes. Texas.

The "barrel-high" Delaware-type basket is the favorite throughout the Atlantic coast region for transporting lettuce, peas and beans. Cabbage and beets are usually placed in crates constructed from rough lumber. Potatoes are either barrelled or sacked, while spinach is either barrelled or shipped in "barrel-high" Delaware baskets. Kale is almost universally shipped in ventilated barrels. Tomatoes grown in the Atlantic coast region are almost universally wrapped and shipped in six-basket carriers of the style used for peaches, while those grown in Texas and California are wrapped and packed in shallow compartment trays or boxes. Late cabbage and potatoes grown at the North for autumn delivery are almost universally shipped in bulk, cattle cars being employed for bulk cabbage and for watermelons. Early in the season relined cattle cars are sometimes used for potatoes, but usually the type of car employed for the shipment of grain is used for potatoes, while, during the winter, insulated refrigerator cars are employed and provided with oil stoves to prevent freezing, if the weather is severe. Cucumbers have been transported successfully from Texas to Boston in refrigerator cars arranged with a false slat floor raised four inches, and half way from floor to ceiling a second slat floor, thus making a double-deck car carrying 400 to 500 bushels of bulk cucumbers. The bunkers of the cars, after loading it with cucumbers, were stocked with ice and in other respects treated as a regular refrigerator car.

Transportation does not determine the type of package used in all cases, as is evident from the character of the packages employed for tomatoes. On the other hand, in the case of long-distance shipment of strawberries the case is quite different. The strawberry requires both refrigeration and a suitable carrier. The character of the product, the season, and the length of the haul, are factors which must be taken into account in the development of a suitable package or carrier. In the case of truck crops not dependent on refrigeration, the style of the package, while governed to some extent by the character of the product, is after that a matter of local convenience. For the shipment of potatoes from regions remote from a suitable timber supply for the manufacture of barrels, sacks are chiefly employed, while, in sections where timber is plentiful and barrels are extensively employed for other crops, the potato is also shipped chiefly in barrels.

Transportation as related to market supply of truck crops.

Transportation facilities determine the possible supply of truck products for any center of consumption, and, to a great extent, as well, the cost of same. The time of the appearance of staple truck products in any particular market is determined by the transportation facilities between it and the section producing the crop.

Modern transportation has proved the greatest competitor of the producer of forcing-house products. Rapid transit and refrigeration have overcome the restrictions which the seasons formerly placed on the markets. Through these improved facilities the door of the market opens into the garden at all seasons.

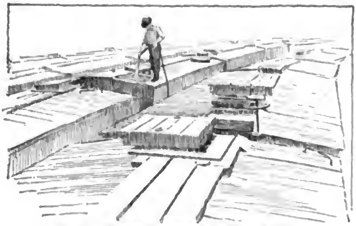
Fig. 74. Washing and preparing refrigerator cars.

Development of transportation facilities.

The development of transportation facilities and the effect on our modern truck and fruit industries is clearly and emphatically brought out in the following historical and statistical account taken from Vol. VI of the Twelfth Census Report:

"The transformation of industries, brought about by modern methods of transportation, is nowhere more clearly evidenced than in vegetable-gardening. Until the last third of the century, just closed, vegetables were grown within a short distance of the market for which they were intended. Canal and early steamboat and rail transportation had, in large measure provided for the distribution of staple farm crops and manufactured articles, but these methods of transportation were too slow to be employed advantageously in carrying the more perishable products. The transition from early conditions to the possibilities of today in the way of a varied diet, when fresh meats may be had in any variety, and when the most delicate garden products of the far South and the Pacific coast may be found at any time of the year in the markets of New England, is a marvel, yet this has been brought about within forty years, and all but the mere beginnings of it belong to the history of the last two decades.

"In the fifties the raising of vegetables for northern markets began at Norfolk, Va. In 1854, the steamer Roanoke carried the first shipment of 200 barrels of garden truck to New York. To secure proper ventilation, however, it was necessary that these should be carried on deck, so that the quantity which might be transported on any trip was not large, 400 packages being about the limit. The boats then in use required at least thirty-six hours to reach New York, and hence the shipment of even small quantities of highly perishable articles was attended with great risk. At the present time forced ventilation allows of loading between decks, increased tonnage enables a vessel to carry as high as 25,000 packages, and the trip is made in nineteen hours.

Rail shipment.

"The first all-rail shipment of garden truck from the South Atlantic states to New York was made from Norfolk, Va., in 1885; the first from Easton, N. C., was in 1887; and the first from Charleston, S. C., in 1888. Florida sent her first carload of oranges to New York in 1888, and her first refrigerated car of strawberries in 1889.

"In the states farther west, where water carriage was not available, rail transportation of vegetables and fruits for Northern markets began at an earlier date. There were shipments of peaches from Crystal Springs, Miss., on a small scale in 1866, and by 1874 they had reached 20-000 pounds daily during the season, and by 1877, 40,000 to 60,000 pounds. Nearly as great quantities were shipped from Terry, Miss., and small amounts from other stations. In Mississippi and Tennessee, the cultivation of strawberries for the northern markets began about 1875. It proved profitable and later spread to Louisiana and Arkansas. The tomato industry about Crystal Springs began about 1875. In 1878, less than one car a day was shipped from that point; in 1885, five to eight cars a day, and in 1895, forty to fifty cars per day. This illustrates the early development of many districts of the South now noted for their truck shipments. In some cases, as at Crystal Springs, the industry began as an experiment in a shipment by farmers of the small surplus of their garden product. This was found profitable and led to further shipments.

"In all sections the trucker is dependent on transportation facilities for increase in his industry. He needs cheap rates and rapid transit; but improvement in carrying facilities is even more important than increase of speed, and of equal importance with lessened cost of transportation. This improvement is especially manifest in ventilated and refrigerator cars, the former being constructed like ordinary box cars except that they have lighter springs and openings in the ends and sides to provide for circulation of air. These openings are covered with fine wire netting. Cars of this type of construction answer perfectly for carrying hardy vegetables, such as watermelons and potatoes, as well as the more delicate kinds, for short distances.

"To meet the needs of the more perishable fruits and vegetables for long transit, the refrigerator car has been evolved. After many years of discouraging experiment, the first successfully refrigerated car of strawberries was shipped into Chicago in 1872 (by Parker Earle). In the spring of 1888, strawberries were successfully shipped from Florida, and in June of the same year a carload of ripe apricots and cherries were sent successfully from Suisun, California, to New York without re-icing. From a beginning of six cars in 1887, sixty cars were operated in 1888, and 600 in 1891. In 1901, it was estimated that there were operating in the United States, Canada and Mexico, upwards of 60,000 refrigerator cars, or nearly one-twentieth of the whole number of freight cars in use. This total includes the cars used in carrying the products of the meat, dairy, beer, and other industries, and it is impossible to say just what proportions of the whole were used in fruit and vegetable transportation. Yet the total is so large that if not more than one-tenth of these cars were so used the increase would still be enormously great. These cars are operated by some fifty or more companies, but the operation of many of them is not extensive, and the larger part of the business is controlled by a few large lines. Many of the railroads are now operating their own refrigerator cars, and in some instances are attempting to exclude private car lines from their roads as far as practicable."

"Formerly much of the early garden truck of the South was sent to the northern markets by express, but express rates are and must continue to be entirely too high for any but a very small volume of business. Moreover, truck sent by express must generally be loaded hastily and carelessly while the train waits, and heavy losses are likely to result from this source. As showing how rapidly the refrigerator cars are coming into use, and the effect of their introduction on the express business in hauling vegetable and fruit cars, it may be noted that from the North Carolina truck district the business carried by the refrigerator cars increased, from 1897 to 1900, 152.3 per cent, while that carried by express companies increased only 31.8 per cent, and that forwarded by open and ventilated cars decreased 82.2 per cent. As a net result of these changes, the proportion carried in refrigerator cars in 1900 was 80.7 per cent, while in 1897 it was only 67.1 per cent.

"Transportation by water is always cheaper than by rail, and cargoes are subjected to less injury from dust, heat, cinders and jolting. Hence, when time can be afforded it is very suitable. A very large share, for example, of the truck from southern Michigan to Chicago, Milwaukee, and lake ports generally, is sent by water, and likewise that from Norfolk, Va., to Baltimore, New York and Boston. For longer distances, however, and particularly from the most recently developed truck centers in Florida, Louisiana, and Texas, high-speed transit is an almost absolute essential, and lines forwarding by water have not been able to compete with those forwarding by rail."

BUSINESS COÖPERATIVE ORGANIZATIONS IN AGRICULTURE

By *James B. Morman*

The organization of modern business rests on competition. What the struggle for existence is to the natural world, the law of competition is to the economic world. To eliminate competition is to create monopoly, a power whose economy is not established on the law of supply and demand, but on the arbitrary will of the directors of the monopolistic business.

Between competition and monopoly stands coöperation. The principle on which it rests is that of "mutual help for self-help." Its purpose is not to destroy, but to build up. Coöperation rests fundamentally on the economic basis of division of labor. Its origin is very simple, beginning, it is said, in the custom of the Swiss peasantry of borrowing milk from one another to secure a sufficient quantity to make a cheese; this led to the pooling of the milk at a common center, the alternate manufacture of the cheese by the different peasants, and the final division of the cheese in accordance with the quantity of the milk furnished by each member of the coöperating group. The mutual help thus rendered was found to bring greater returns at less loss and less labor than an individual could expect or secure if producing milk and making cheese in his individual capacity.

Extent of coöperation.

Some conception of the growth of coöperation may be had by a consideration of the bibliography devoted to the subject directly or indirectly. The Bibliographie Coöpérative Internationale, a volume of more than three hundred pages issued by the International Coöperative Alliance in 1906, gives 5,761 entries from nations and dependencies representing twenty-five different languages; of these entries 5,494 stand for books, pamphlets, and articles in reviews, and 267 for periodical publications. French publications of agricultural coöperative insurance and articles from specifically coöperative publications are omitted. These entries deal directly or indirectly with coöperation, profit-sharing, and cognate subjects.

The ease with which agriculture lends itself to the coöperative movement may be judged from the statistics of this bibliography. Of the 5,761 entries, agriculture proper has 915 and rural credit societies 557 entries. As rural credit societies are composed of farmers, the entries belong under agricultural coöperative credit and are placed under "credit" for index purposes only. This puts agriculture in the lead of all other forms of coöperation, with 1,472 entries; coöperation in general comes next, having 1,412 entries allotted to it, followed by "credit," with 1,100, more than half of the entries, however, referring to rural credit societies. For comparative purposes we give the remaining figures: Distribution, 630; profit-sharing and copartnership, 461; legislation, 273; production and labor, 273; history, 266; settlement and land-holding, 152 (which could also be placed under "agriculture"); workmen's dwellings, 144; education, 48; insurance, 47; women's part in coöperation, 23; and coöperative housekeeping and lodging, 17. As to countries, France leads in respect of coöperation applied to agriculture even though agricultural insurance is partly omitted, Italy leads in respect of credit coöperation, and the United Kingdom is strongest in general subjects and distribution.

Business methods of coöperation.

From the above-mentioned custom of cheese-making has developed the modern system of coöperation, which includes nearly every important industry in many of the foremost nations in the world. The modern conception of coöperation dates back, probably, to Robert Owen, who was born in Wales in 1771. He became a great cotton spinner and conducted a scheme of profit sharing and improvement for his employees. Though his scheme was an economic failure, it did not live in vain. The advantages of coöperation to the producer and consumer of wealth,—and particularly such forms of wealth as agricultural products which belong in the list of necessities—were readily observed, and the main problem was to perfect the system on an economic business basis.

With coöperative stores at the present time the principle of management is what is known as the Rochdale system. Each member is limited to one vote in the election of directors, by whom the business is managed. Only such goods as are of standard quality and in constant demand by the members are bought, and they are sold to the members for cash at the ruling retail prices. Cash payments are invariably required and fair prices maintained. A record is kept of the purchases of each member and the profits are divided quarterly. After setting aside certain sums for interest, depreciation, reserve, and education, the balance of the profit is paid as a dividend on the amount of purchases. The dividend on purchases is paid in cash at the end of the quarter or may be left in the treasury as loan or share capital. Thus, the savings are constantly invested in the business. This is the general principle under which the coöperative purchase and sale of products are conducted.

AGRICULTURAL COÖPERATION IN THE UNITED STATES AND CANADA

The origin of agricultural coöperation in the United States may be traced to the establishment of the Brook Farm in 1841. The preamble to the articles of agreement and association signed by the Brook farmers states as two of the objects of organization to be "the substitution of a system of brotherly coöperation for one of selfish competition," and "to institute an attractive, efficient and productive system of industry." Hawthorne, who was for a short time a member of the society, wrote as one of the purposes of the movement that "we sought our profit by mutual aid." Notwithstanding the lapse of nearly two-thirds of a century since these words were written, the principles embodied therein constitute the guiding stars of modern coöperative associations, not only in the United States, but the world over.

There is a vast difference, however, between the Brook Farm and modern agricultural coöperative societies. The former was in reality a communistic body whose objects were largely sociological, while the latter are strictly economic in their functions, which extend, as a rule, no further than the securing of profits to the members from the coöperative production, shipping, marketing, and sale of products, and from the coöperative purchase of seeds, fertilizers, implements and similar agricultural necessities.

As society is at present constituted, there are three parties to an ordinary purchase and sale transaction—the producer, the middleman, and the consumer. To eliminate the profits of the middleman is one of the purposes of coöperation. Another object is to secure credit at as low a rate of interest as possible, and when society or the state fails to afford such an opportunity, the formation of mutual credit banks for this purpose has been instituted. The development, extension, trend, and economic aspects of these phases of the coöperative movement in the United States and Canada will occupy our attention.

There is a widespread feeling both in this country and abroad that agricultural coöperation in the United States is comparatively undeveloped as compared with the movement in Europe. It undoubtedly arises from the fact that there are no official statistics as to the kind and number of agricultural coöperative organizations in the United States. Neither the Bureau of the Census nor the Department of Agriculture collects data relating to such organizations, and no one in an individual capacity could do so. But the Bureau of Statistics of the Department of Agriculture has about 45,000 county correspondents scattered over the United States, and they have been authorized to report on the kind and number of agricultural coöperative societies:

	Estimated number
Insurance—	
Fire, lightning, hail and wind	2,000
Live-stock	150
Life insurance	7,500
Sickness, funeral, and family relief .	6,000
Selling	1,000
Buying	4,000
Production— (including dairying and fruit-drying)	75
Communities, colonies and settlements .	50
Miscellaneous (live-stock, horticulture, forestry, apiculture, etc.)	300
Telephone service	15,000
Social, economic and educational . . .	1,500
Irrigation	30,000
Grain elevators	1,800

From the foregoing data it is possible to arrive at an estimate of the number of different classes of coöperative undertakings in the United States that will not be far from the actual figures.

Based on data secured previous to 1907, it has been estimated that there were in the United States at the close of that year about 85,000 farmers' coöperative organizations, with an estimated membership of more than 3,000,000, after deducting those enrolled in more than one organization.

In order to show to what extent the coöperative movement has developed in agriculture, the following table presents the number of individual and coöperative creameries and cheese factories in the United States in January, 1908, as typical of the movement in other branches of the industry:

State	Creameries		Cheese factories	
	Coöperative	Independent	Coöperative	Independent
Arizona	. .	4	. .	4
Arkansas	3	2	. .	. .
California	19	118	1	172
Colorado	3	19	. .	17
Connecticut	16	15	. .	.
Delaware	1	7	. .	1
Dist. of Columbia	. .	. .	. .	. .
Georgia	. .	4	. .	. .
Idaho	. .	12	. .	4
Illinois	52	180	2	61
Indiana	39	57	4	21
Iowa	334	254	1	34
Kansas	4	49	. .	14
Kentucky	5	4	. .	. .
Maine	4	22	. .	9
Maryland	. .	46	. .	. .
Massachusetts	18	16	1	. .
Michigan	64	231	6	131
Minnesota	562	317	23	86
Missouri	11	25	2	6
Montana	2	6	. .	. .
Nebraska	6	40	. .	2
Nevada	2	3	. .	. .
New Hampshire	5	22	. .	3
New Jersey	. .	21	. .	. .
New York	92	568	49	1,082
North Dakota	27	52	1	. .
Ohio	21	120	2	218
Oklahoma	4	20	. .	. .
Oregon	6	109	2	65
Pennsylvania	94	308	13	96
Rhode Island	. .	1	. .	. .
South Dakota	38	73	. .	10
Tennessee	1	3	. .	. .
Texas	. .	24	. .	. .
Utah	. .	36	1	27
Vermont	55	99	1	48
Virginia	1	1	. .	2
Washington	9	36	3	11
West Virginia	. .	1	. .	. .
Wisconsin	274	728	243	1,406
Wyoming	. .	6	. .	. .
Total	1,772	3,659	355	3,530

This list does not contain the centralizing plants nor the combination creameries and cheese factories. By combinations is meant stock or individual companies operating more than two factories or creameries.

The data are derived from the mailing list of the Dairy Division, United States Department of Agriculture.

On September 1, 1908, the data were as follows: Coöperative creameries, 1,939; coöperative cheese factories, 351. Compared with data in the table above, these figures show a gain of 167 coöperative creameries and a loss of four coöperative cheese factories for the first eight months of 1908.

There is scarcely a branch of the agricultural industry in the country at the present time into which coöperation has not penetrated. Among the more important may be mentioned—

Fruit-growing and marketing,
Fruit-drying and selling,
Dairy products, marketing,
Field crops, marketing,
Vegetables, marketing,
Turpentine and rosin, making,
Live-stock, breeding,
Vegetables, canning,
Wheat and corn, milling,
Beet-sugar, making,
Wool, production,
Tobacco, marketing,
Cotton, marketing,
Poultry products, selling,
Honey, shipping and selling,
Cotton, ginning,
Wheat, thrashing,
Grain, elevating,
Wine, making,
Butter and cheese, making,
Cider, making.

There are organizations more or less coöperative which have different objects in view. Some, for example, aim to control coöperatively the output of particular agricultural products grown in certain states or certain sections of the country; others aim to combine producing farmers into national organizations more or less coöperative; while still others, as the Farmers' National Congress of the United States, are maintained "for the consideration of national questions related to agriculture in a broad, national manner," and include as members not only farmers, but "such persons as have in any prominent manner been instrumental in advancing the interests of agriculture." Of such state and national organizations of these types, the following, for their great prominence and broadness of scope, may be mentioned:

American Breeders' Association, American Cane Growers' Association, American Cranberry Growers' Association, American Farmers' League, American Forestry Association, American Pomological Society, American Poultry Association, American Society of Equity, Association of Agricultural Colleges and Experiment Stations, California Fruit Growers' and Shippers' Association, Cured Fruit Association, Farmers' National Congress, Farmers' Society of Equity, Forest, Fish, and Game Association, Hood River Fruit Growers' Union, International Farmers' Union, International Society of Arboriculture, National Bee Keepers' Association, National Dairy Union, National Farmers' Alliance and Industrial Union, National Grain Growers' Association, National Rice Association, Northwestern Independent and Farmers' Elevator Association, Patrons of Husbandry, Peninsula Produce Exchange of the Eastern Shore of Maryland, Raisin Growers' Association, Southern California Fruit Exchange, The Coöperative Commission Company, The North Fork Fruit Growers' Association, The Tri-State Grain and Stock Growers' Association, Wathena Fruit Growers' Association, and many others.

The whole list, if printed, would seem formidable. The above general statement is, however, sufficient to show the extension of the movement. Instead of being backward in the matter of coöperation, the farmers in the United States, as well as in Europe, are the greatest of coöperators.

Broadly surveyed, there seems to be a centralization of coöperative undertakings in different sections of the United States. Thus, creameries are centralized in the North Central and Western states, particularly in Iowa, Wisconsin and Minnesota; fire insurance in New York, Pennsylvania and the North Central states; irrigation in the Rocky mountain and Pacific coast regions; the marketing of fruits in the West, particularly in California, where 80 per cent of the fruit is coöperatively graded, packed and sold; vegetables in New Jersey, Ohio, Illinois, Missouri, Arkansas, Texas, Louisiana and somewhat on the South Atlantic coast; milk in New England and New York, and wheat in the Northwest. The coöperative purchase of farm supplies is especially developed in Utah. Compared with Europe, the one noticeable lack of coöperation in the United States is that of credit or mutual banks. Otherwise as to number and extent, the movement in this country compares favorably with coöperation in any part of the world.

The growing and marketing of fruit.

No branches of the agricultural industry are better adapted to illustrating the methods and extent of coöperation in the United States than the growing and marketing of fruits and vegetables. The business in the former has become very extensive during the past few years. A study of these facts and figures, therefore, will serve to indicate the extent, the trend, and the economic limitations of the coöperative movement.

Among the striking successes of coöperation is the marketing of fruits by the California Fruit Growers' and Shippers' Association. Fully 80 per cent of the fruit shipped out of the state is under the control of this association. At the present time there are about 8,000 members in the California fruit-growers' coöperative societies, scattered over an area of 80,000 square miles. The southern California societies alone sell annually products to the amount of $8,000,000, shipped to markets ranging anywhere from 1,000 to 6,000 miles away.

The state of Colorado likewise does a large coöperative fruit business. In 1907, there were thirty-three associations in the state. The following brief account of the oldest association assists in giving an insight into this form of successful coöperation. The Grand Junction association was started in 1891, when a few growers combined and appointed one of their number salesman of their fruit for the season. This plan was continued up to 1897, when the increase of business made the appointment of a regular manager necessary. The following summary table shows the growth of the business at Grand Junction from that time to the close of 1906:

Year	Paid to growers	Total business	No. of cars shipped
1897	$54,085 00	$88,937 00	167
1898	21,785 00	43,750 00	89
1899	21,346 00	56,591 00	82
1900	68,323 00	114,590 00	202
1901	98,972 90	153,380 00	256
1902	195,975 15	287,887 15	613
1903	247,188 45	339,305 41	682
1904	437,154 33	557,291 11	1,282
1905	475,763 00	608,403 30	797
1906	555,813 44	814,278 62	1,036

The number of stockholders in this company in January, 1907, were 666, and the number of shares of stock sold were 14,169. This association is doing the largest business of any coöperative society in the state, but has not been the most successful. When it is remembered, therefore, that there are no less than thirty-three such organizations in the state of Colorado alone, these figures furnish some idea of the enormous amount of business that is conducted coöperatively in fruit-growing and marketing throughout the United States.

But in order that we may ultimately see the economic limitations of coöperation, it will be necessary to note the methods of conducting business.

There are two methods of packing and grading fruit, as practiced by the Colorado associations.

(1) The association does the packing. In this case the growers deliver the fruit direct from the trees to the packing-houses. Here the association's packers sort, grade, and pack the fruit into boxes or crates, the culls being returned to the grower. The grower's number, which is given to him at the beginning of the season, is marked on each package with the grade of the fruit. When loaded into cars a strict account is kept of the number of boxes, varieties, and grades of each grower's fruit. In this way the price for each box of fruit in any car is easily determined.

(2) The growers do the packing. This occurs when there is a large amount of fruit to be handled. When the growers do the packing the association hires an inspector whose duty it is to inspect every load as it is delivered. This he does by opening the boxes—on the side in the case of apples. If the pack is satisfactory, not more than two boxes are usually opened. If, on inspection, the pack is found unsatisfactory, the entire load must either be placed in a lower grade or the whole repacked. In this case, likewise, each one's fruit is designated by number. Most of the associations have now adopted the latter method as the more satisfactory, for the reason that when a grower does his own packing he has a respect for the judgment of the inspector. To repack a load of fruit is found to be rather expensive, as is also the placing of fruit into a lower grade, and one experience is usually sufficient. Notwithstanding so much care, poorly packed fruit sometimes finds its way into the market.

The association charges a commission on all sales to defray expenses. This is usually 5 per cent, and when the packing is done by the association, an additional charge is made to cover the cost of box and labor of packing. The surplus, if any remains is distributed as premiums.

The system of selling has been somewhat changed during the past few years. Formerly, all fruit was consigned to commission men, but on account of dissatisfaction with the returns made by the consignees as to the condition of certain shipments of fruit made by the associations, the plan of selling f. o. b. is largely practiced, consignments are made only to well-known firms, and much of this fruit is sold at auction.

Even with this arrangement difficulties sometimes occur, so the custom of the associations sending agents to the most important distributing points has arisen. It is the duty of the agent to inspect all cars that come into his territory, as near the destination as possible, and thus protect the association from dishonest buyers, and adjust differences that arise when fruit actually reaches the buyer in poor condition. This is the system practiced when fruit is sent by freight in car-load lots.

Shipments by express are made only to nearby points. In such cases the growers receive exactly what the fruit brings less the express charges and the association's commission. This practice is confined largely to early fruits, but the business by express is exceedingly limited on account of high express rates.

The growing and marketing of vegetables (p. 252).

The supplying of fresh vegetables to our large cities has become a great business, particularly in the South Atlantic and Central states. This business is largely conducted in connection with the raising of small fruits, and frequently the shipments include both fruits and vegetables. The perishability of such products and the long distances they have to be hauled, often from the warm to the coldest parts of the country, render the problems of transportation and coöperation a little more intricate. A brief statement, therefore, of the methods employed in this branch of agriculture for the disposal of the goods will make clear the economic limitations of agricultural coöperation.

Truck-farming in the South has developed wonderfully since the opening up of direct lines of transportation between the North and South. The bringing of fresh vegetables into the northern city markets was the very means of extending this branch of the industry still farther south in order to get the earlier crops. In the early days of transportation, however, the extreme southern producers had to pay high rates on account of the long hauls to market. This was found a great burden to the truck-grower in addition to the risks involved in sending such produce to northern markets on account of the time involved in transit. To meet this difficulty the growers formed associations for the purpose of inducing the railroads to give them better service and reduced freight rates, and in order that the associations might study to effect improvements in the manner of handling truck produce both at the point of dispatch and at the destination. The traffic has developed in both directions. While the bulk of the business of this nature is from the South to the North, large quantities of northern-grown potatoes, cabbages, onions and celery are transported to the South every winter. The results of coöperation in regard to improvement in service have been pronounced. The railroads now provide modern ventilated cars and refrigerator cars that ride as easily as passenger coaches, they are run to destination on passenger-train time, and the vegetables are placed on the market almost as fresh as at the time of gathering. The ventilation and refrigeration of the cars on the most improved scientific principles have tended to bring about this important result.

The small grower alone could not expect to reap very great returns from his industry on account of the high transportation rates which the improved and rapid methods of hauling necessitated. But by organizing into associations the growers were able to secure car-load rates, which worked to the mutual advantage of shippers and railroads. Stock is usually issued at ten dollars per share, and any grower of vegetables who has purchased a share is considered a member. The business of an association is controlled by a board of managers who appoint a local agent and a receiver or general consignee at the point of destination. The shippers consign their products to whatever commission firm they wish, and the general consignee meets the cars at destination, pays the freight charges, and makes delivery of consigned goods to the respective commission houses. The latter render their bills of sale, deducting the various items of expense, such as commission of 10 per cent, freight, cartage, and the like, and remit by check or otherwise direct to the shipper. Among the items of expense is a small percentage collected for the association in order to defray cost of management. Suppose, for example, the freight charges amount to thirty dollars per car, the charge for consignee's services at five dollars per car, then the consignee collects an amount aggregating forty dollars per car, five dollars of which is remitted to the association.

The advantages of such a system are (1) that the grower is relieved of much trouble in shipping, gets car-load rates on small shipments, gets honest returns, and is encouraged to increase and improve his products ; (2) the railroad gets more freight to handle, is relieved of the responsibility of loading and unloading, and in collecting freight charges has to deal with one or two persons only instead of a great many. This latter is quite important when it is remembered that five of such associations have shipped during the past few years an average of 1,950 car-loads of truck-stuff per annum.

At several places situated on the southern railroads, associations have been formed which deal with special products, for example, strawberries at Independence, La.; radishes at Roseland, La.; tomatoes at Crystal Springs, Miss.; and cucumbers at Canton, Miss. Such traffic requires quick travel.

The following table shows the number of cars loaded with fruit and vegetables and the growth of coöperative shipments from stations on the southern lines and from points in Illinois, handled for the American Express Company alone:

Year	No. of cars
1898	291
1899	325
1900	380
1901	454
1902	465
1903	565

These facts show plainly enough that when the coöperative principle is confined to the shipping of fruits and vegetables, and not to the pooling of interests, the results have been mutually advantageous to shippers and railroads. The records of such associations show increased returns to the producers of wealth.

Failures, however, are recorded, but more frequently, if not entirely, when products are pooled. The reason for this lies in human nature rather than in coöperation. Farmers are proverbially suspicious, and when fruit, for example, is pooled, one is apt to think that he is furnishing a better grade of fruit than his neighbor. Each one fears some other will reap a special advantage. So petty jealousies arise, and the appointment of manager, shipping agent, and other officers affords further opportunity for association quarrels. In the end, the association fails for want of hearty coöperation on the part of the members. This is one of the obstacles to the complete success of agricultural coöperative organizations.

The coöperative movement in Canada.

The extent of coöperation in agriculture in the Dominion of Canada is not so great as it is in the United States, nor has the movement extended into so many different branches of the agricultural industry. It is confined, almost entirely, to coöperative grain-threshing, dairy, fruit-growing, livestock and poultry associations.

The early records of Canada show that there were agricultural societies, though not of a strictly coöperative type, as far back as 1798. The earlier associations partook more of a social nature, the farmers gathering together once a month or so to eat dinner and to exchange views on the best ways in which agriculture could be improved and the farmers' interests advanced. In 1830, an act was passed in Ontario that provided that when an agricultural society was organized in any district for the purpose of importing valuable stock, seed, or machinery, or undertook anything for the improvement of agriculture, the government would assist by granting £200, provided the society raise £50. This was a case of the government coöperating with the farmers to further the interests of agriculture.

While under the provisions of this act the formation of district societies spread so rapidly that in 1846 there was organized a Provincial Board of Agriculture, one of whose functions was to hold exhibitions and encourage the growth of coöperative societies, still they were not business coöperative organizations in the sense previously outlined. The societies took to holding exhibitions in which prizes were granted for excellence in the raising or introduction of stock, invention of implements and machinery, and the production of garden or field crops. The coöperative production, packing, marketing, and purchase of goods fell almost out of sight. Agriculture did not derive much stimulus from organizations conducted on such a basis, and for about half a century the modern conception of business coöperation among farmers in Canada was a dead letter.

The new impetus to coöperation arose as a matter of necessity due to changes in economic conditions. The great increase of immigration into Canada, largely of the agricultural class, during the last half century, led to the laying out of a great deal of land into apple orchards and the making of dairy farms. The latter gave rise to the great development of butter- and cheese-making in the Dominion, while at the same time the domestic market was not growing equally fast. The natural result was an enormous supply of dairy products and a limited demand in Canada, and as a consequence prices fell and the Canadian dairy farmer operating independently could find no profitable market for his products.

The really business side of agricultural coöperation has developed in Canada during the past ten or fifteen years. Not having a sufficiently extensive market at home for the disposal of his dairy products, the Canadian farmer turned to the mother country as a natural outlet for his surplus butter and cheese. But even here he was at a great disadvantage, for the English market was already being supplied with this class of goods from Ireland, Denmark, and other near-by countries. The extreme remoteness from the English market, entailing heavy charges for freight rates, and the like, made it practically impossible for the farmers of Canada to compete with the farmers of Ireland and Denmark in the sale of dairy products in the English markets, unless they could by some means secure greater economy in their production, ship in larger quantities, and produce goods of a higher grade and greater uniformity.

It was self-evident that the farmer acting alone could meet none of these economic conditions, and he was driven by necessity to the principle of coöperation as a possible and practical solution of the problem of disposing of his surplus dairy products at a profit. Consequently, coöperative creameries and cheese factories were organized in Canada on much the same basis as in the United States and other countries. The movement, however, is of too recent a date to show any great results. The coöperative factories are few in number, but the reports of the Dairy and Cold Storage Commissioner, as well as the reports of the English Board of Agriculture and Fisheries, show a gradual improvement in the quantity and quality of Canadian dairy products shipped to the markets of Great Britain.

The reasons for the development of coöperation in dairying are, in a great measure, applicable to the many other forms of agricultural coöperation, such as grain-threshing, live-stock and poultry-raising, and fruit-growing, which have recently begun to take root in Canada. The development of coöperation in fruit-growing and marketing is particularly interesting as showing what the movement can do to improve the economic condition of farmers. We shall therefore consider the fruit-growing and marketing phases of coöperation in Canada in more detail.

Coöperative fruit-marketing in Canada. (See article in Chapter IX.)

The strictly coöperative apple-packing and marketing associations in Canada arose in the province of Ontario. Their origin may be traced to economic conditions similar to those outlined as the cause of dairy organizations. The large immigration of agriculturists led to the planting of orchards on nearly every farm, so that there originated in this manner during the past thirty or forty years a large number of small orchards which aggregated in 1908 about eight million bearing trees in southern and western Ontario alone. The result was a great over-production of apples, so that they frequently went to waste in the orchards for the want of a market, especially in those orchards remote from the cities. To prevent this waste, the farmers looked about for a market, and the export trade in Canadian apples to British markets began under these conditions on a small scale some forty years ago.

The price received at first was very low, but the fruit was not the best nor packed the best. Nevertheless, the apple trade between Canada and Great Britain became firmly established, and a gradual development took place in methods of growing, buying, grading, packing and shipping apples.

In the first place, the export trade was the means of encouraging the further development of apple-growing in Canada, and more care was exercised by orchardists in the planting of suitable varieties. As the new orchards came into bearing it naturally happened that the markets began to feel the pressure of the increased supply, and prices again fell, particularly in 1896 when there was a phenomenal crop. In that year, the price of apples fell so low in Canada that little or no profit remained for the grower, and thousands of barrels rotted on the trees or were fed to stock. This condition of affairs continued up to the year 1900. On the authority of the Ontario Bureau of Statistics the apple crop for that year was about twelve million three hundred thousand barrels in that province alone, and after citing the number of barrels exported and consumed in the Dominion, it was concluded that some seven million five hundred thousand barrels of apples went to waste. To find a remedy for the situation an inquiry was made by both government and private authorities, and the conclusion was reached that, if Canadian farmers were to cater successfully to the foreign trade, they would have to meet successfully four requirements, namely—(1) large lots of fruit; (2) few varieties; (3) uniform picking, grading and marking; and (4) the employment of skilled labor.

It is self-evident that only in very large orchards could it be possible to carry out these requirements under regular business conditions, and no hope was apparent for the small orchardist.

With the object of providing a remedy for these evils, the fruit-growers of Canada adopted the coöperative method of selling apples. The system practically began after the year 1900, and was instituted primarily to combine a number of small lots of apples into car-load lots in order to secure reduced freight charges. Each member originally graded and packed his own apples, while the selling was entrusted to one of the members. But the packing was not found to be uniform, and it was proposed to adopt coöperative grading and packing as well as selling. Consequently societies were incorporated for these purposes, and managers were employed to operate associations on regular business principles.

The results of the coöperative movement among the Canadian fruit-growers may be realized by a brief consideration of the returns for the year 1906. There were in successful operation during that year nine coöperative fruit, vegetable and produce associations in British Columbia and twenty-five in Ontario. The members of the coöperative associations in Ontario sold the greater portion of their apple crop in 1906 at two dollars and twenty-five cents per barrel, while many outside growers sold for one dollar per barrel only. One apple-buyer reported that he secured 2,000 barrels in Southern Ontario at fifty cents per barrel. This difference in price can only be accounted for on the basis of lack of organization. The total export trade for the year in apples amounted to about five million dollars, the bulk of which is due to the activity and standard products of the coöperative societies.

While coöperation has made such great progress and produced such important economic results for the orchardists of the above-named provinces, the movement has not been equally successful in the other provinces. It is said that in Nova Scotia the movement has been greatly impeded by agents for transportation companies and British selling firms. These men get a rebate on all fruit they can divert to particular steamship lines and selling agents, and they do not like to lose this income, as they certainly would if coöperative principles were adopted. These men, therefore, are using every means to prevent the spread of coöperation in all parts of the Dominion.

Though business coöperation among farmers in Canada is in its infancy, the foregoing facts are sufficient to show that the movement is well established, has produced important financial results for those associated together, and that it promises great things for the farmers who are engaged on a small scale in any branch of agriculture. In competition with the Danish trade in the English markets, a great field is open to Canadian farmers along the lines of the coöperative production and marketing of butter, cheese, eggs and bacon.

The trend of coöperation in agriculture.

By this general survey of coöperation in the United States and Canada one cannot but be convinced that it has been on the whole advantageous to the producer rather than to the consumer. One of the primary objects of organization was to secure greater returns to the producer, and the foregoing statistics show that this result has been accomplished. The benefits that have accrued, however, have resulted to producers in a different manner than was anticipated. It was expected that coöperation would dispense with the middleman and that his profits would yield the increased returns to the producer. But the middleman has only been eliminated to a small extent, and that almost wholly in the case of the itinerant buyer. In other respects, coöperation has had to employ the modern economic and social machinery of wealth distribution in almost every particular.

The increased returns have been secured through the improvement in the quality of products as the chief source, and through the distribution of premiums on the sales that take the place of profits in ordinary business. The former trend of coöperation has been quite noticeable in the production of dairy products and the growing of fruit. The standard of these and other agricultural products has been greatly improved by means of coöperation, and the increased prices received for the goods have materially increased the returns to the coöperating group of farmers. This is particularly noticeable in the case of the Hood River Fruit Growers' Union of Oregon which has more than a hundred members. In four years this association raised the price of apples from 85 cents to $2.50 and $3.15 per box, according to grade and variety of the fruit. Apples shipped to England in 1906 netted the Hood River growers $1.32 per box for the same grade that sold for 85 cents in the United States. Then the reduced rates on car-load lots and the sharing of profits among the members of associations have also had a tendency to yield larger returns to the producer.

The trend of coöperation has been toward increasing the returns to producers in other branches of agriculture than in apple-growing and marketing. The larger profits are due in some measure to the methods of doing business. Thus the Wathena Fruit Growers' Association, a western organization of farmers, practically sells all its fruit on track, although sometimes small quantities left over after filling a car are consigned to reliable dealers. After the manager knows the price to be received for a car-load of fruit, he makes a platform price to the grower accordingly. This is usually about 25 cents a crate less than the price received by the association. If, for example, a car-load of strawberries has been sold for $1.50 a crate, the platform price will be $1.25, and every grower who delivers fruit of this kind up to the standard in quality receives a ticket, which he can collect at any time, entitling him to $1.25 a crate. The next day a car may be loaded at $1.75 a crate, and then the platform price is $1.50. When the strawberry season is over the expenses of the association in handling the crop are deducted from the 25 cents retained on each crate, and if any sum remains, it is apportioned among the growers who furnished the fruit according to the original sums received as the platform price. This plan is followed for other fruits and for vegetables during the season.

To show how this plan works for the benefit of the grower, let us consider one season's work by the association. In 1906, it handled 7,000 cases of strawberries. The bulk of this fruit sold at a platform price of $1.50, the minimum being $1.25 a crate. After the season was over and all expenses had been paid, the growers received an additional apportionment averaging 12½ cents a crate, as the balance remaining from the 25 cents collected by the association on every crate of fruit.

In addition to strawberries, this association handled more than 9,000 cases of raspberries which sold at a minimum price of $1.75 a crate. Also some 15,000 crates of blackberries were sold, the market opening at $2.00 and closing at $1.25 a crate. The bulk of this fruit was sold at $1.50 a crate. On the St. Joseph market independent growers were selling blackberries to local shippers for 90 cents or $1.00 per crate, while similar fruit marketed through the Wathena Association netted the growers $1.25 a crate. The association likewise handled large quantities of cherries, plums, peaches, grapes, and apples.

When one considers that this association during the small-fruit season sold about 2,000 crates a day, it is not hard to figure what this means to the members who realized on an average 25 cents per crate more than the growers who sold through the regular channels of trade.

Turning to the East we find similar successful coöperative organizations. One of the best organized and managed is the Peninsula Produce Exchange of the Eastern Shore of Maryland. This exchange has twenty-five shipping points along the lines of the New York, Philadelphia, and Norfolk Railroad, and the Baltimore, Chesapeake and Atlantic railroad. An agent at each shipping point inspects and grades the fruit and truck received and reports the amount and grades daily to the head office at Olney. The general manager, being in touch by wire with prices in all the large markets, makes his sales and consignments accordingly. The exchange expends over $10,000 annually in telegrams regarding crops, markets and prices. In 1905, the capital stock of $31,000 which was owned by 2,500 farmers selling through the exchange, paid 7 per cent dividend, and still a surplus was left which was laid by for emergencies. In 1906 a dividend of 10 per cent was declared. The exchange forwards annually thousands of carloads of sweet and Irish potatoes, truck crops and fruits, the total trade in the years 1905 to 1907, inclusive, amounting to between $5,000,000 and $6,000,000.

These facts and figures show that coöperative selling associations, when properly organized and managed, may be of great value to the growers of all forms of produce connected with them.

There is no evidence, however, that the consumer has reaped any material benefit by the movement, except possibly in an indirect way. It is part of the policy of coöperation to maintain the regular prices of commodities so as to increase the profits to members. The only benefit the purchaser receives, therefore, is in the improved quality of goods purchased. While this is not always the case, it is a real benefit to consumers when it does occur. On the whole, however, one of the chief purposes of coöperation, which is to bring producer and consumer together for their mutual benefit, has failed in the latter part of the program.

Another tendency is very noticeable, and that is the trend of coöperative associations to become corporations. Many are incorporated under state laws, and in California, where so much of the fruit industry is in control of coöperative societies, the question is now being legally tested by the courts as to whether or not the coöperative fruit organizations are subject to the state law as applied to corporations.

There is one other phase of the coöperative movement worthy of mention, not because it differs materially in principle from productive coöperation, but simply because it expresses the other side of the movement and that is coöperative purchase of farm supplies. Many associations buy their supplies coöperatively, such as seeds, fertilizers, feeding-stuffs, implements and machinery, for the same reasons that they sell coöperatively—to secure reduced freight rates, lower purchasing prices in bulk, and greater returns to themselves. The majority of associations combine for sale and purchase of products, while some combine for the purchase of materials only. This is particularly the case when farmers in the same neighborhood are not engaged in the same branch of the agricultural industry.

Economic limitations of coöperation.

As we have before stated, one of the objects of coöperation has been to secure to the producers greater returns by cutting off the profits of middlemen. Thus, Article 2 of the Constitution of the Hood River Fruit Growers' Union reads: "The objects of this corporation shall be to secure to fruit-growers of Hood River valley and vicinity all possible advantages in the marketing of their fruit, as well as to build up a standard of excellence, and to create a demand for the same." These are worthy objects, it must be confessed, but how they are to be coöperatively accomplished is not intimated. The important question is, therefore, Does coöperation dispense with the economic machinery of distribution?

The improvement of the quality of products, whether accomplished through the ambition of the individual to excel or through the efforts of an association to bring all members up to the same standard when products are pooled, would, as a general rule, bring better returns to the producer on the merits of the goods. In ordinary business dealings the better quality of products brings better prices; and when a standard of excellence is maintained the public is usually willing to pay the higher price for the better quality of goods. There is certainly an economic limit, then, to coöperation in this direction.

When coöperation is considered from the standpoint of the elimination of the middleman, the case is still weaker. The very organization of industry, whether individual or coöperative, creates middlemen whose function it is to serve as the agents between producer and consumer. A coöperative organization has to employ overseers and factory hands when dairy products are manufactured; stores for the grading, marketing, or retail selling of eggs have their clerks and other employees. In fact, the only difference between the commercial and coöperative systems is that with the latter the expenses are under the control of the organization, and what can be saved in running expenses helps to increase the returns to the producers, whereas over the profits of the commercial middleman the producer has no control. That the middleman's profits were frequently large and out of all proportion to the value of the economic or sociological functions performed there can be no question; that the small farmer, whose products are highly perishable, was frequently placed in an unenviable position on account of the very nature of his industry is also beyond question. But it was to equalize the rewards of labor on the part of these two parties in the production and distribution of agricultural forms of wealth that called into being the coöperative organizations, and little consideration has been given to the welfare of the third party in the transaction—the consumer.

The economic limitations of coöperation, therefore, appear in the facts that the commercial relations still prevail, though in a modified form, under the coöperative régime, and the consumer reaps no benefit because there is no reduction to him in the cost of the means of subsistence and other products so marketed.

Though these difficulties may not be overcome, the great benefits that have followed the institution of coöperative societies among farmers in the United States, especially in the advantages that fall to the lot of the small farmer who, in many respects, is placed on the same economic level as the large grower and shipper, prove it to be one of the most practical agencies yet conceived for promoting the real welfare of the agricultural classes.

Coöperative credit. (See page 269.)

The coöperative movement in the United States, surveyed as a whole, and compared with its development in Europe, reveals the lack of one important feature. The formation of mutual credit societies or banks in this country has been almost wholly neglected. Such institutions have been established in a few states, but their number and influence are very limited.

In Europe, however, the reverse is the case. The need of credit is badly felt among the farmers, and this phase of coöperation has developed enormously, in many countries out-classing any other form of coöperation and, in some, out-numbering all other forms put together. In Germany, for example, out of 20,845 coöperative societies in existence on May 1, 1907, no less than 14,043 were savings and loan associations on a mutual basis. The purpose of such organizations has been to furnish necessary capital to those who could give no security, as well as to those who could give security, and at cheaper rates of interest than elsewhere. The popularity of this phase of coöperation is shown by the number of local mutual credit banks in various countries. Thus, in addition to Germany, Austria has 4,300, Hungary 1,814, France 1,638, and Italy 1,608 such banks. The significance of mutual credit to the economic welfare of the small farmer in Europe is shown by the fact that the collection and publication of data regarding agricultural credit is particularly emphasized as one of the functions of the International Institute of Agriculture, which began its active life in the world in 1908.

Mutual credit has been of especial importance to the small farmer, whether owner or tenant, who, with no security except his personal standing as an upright man among his fellow members, could borrow money with which to purchase seeds, fertilizers, implements, stock, or other materials necessary to the proper exploitation of his holding. It has helped him to increase his income, give better care to his family, and encouraged him to remain on the farm. While the abandonment of farms in the eastern United States is becoming a serious problem and while the scarcity of farm labor is even still more serious, no one has thought of asking whether the payment of high rates of interest and the difficulty of securing credit have had anything to do with these rural phenomena in America.

The purpose of calling attention to these facts is to fix attention on the future possibilities of coöperation, and to contrast the negative with the positive results of the movement. In addition to the numerous benefits that have come to the members by the better prices, easier methods of securing credit, better returns for labor, better terms in purchasing supplies, and cheaper transportation rates—coöperation has had a tendency to keep the people on the land and thus, to some extent, to relieve the problem of the over-crowding of cities. And how to keep the people on the land is one of the most serious of national problems. The scarcity of farm help is largely universal today. Therefore, any movement that has a tendency to encourage the rural population to continue the pursuit of agriculture should receive the heartiest support of national governments. To this end there is no movement so propitious at the present time as the coöperative organization of agriculture, the industry that of all industries possesses within its range the chief factors for promoting the highest degree of national welfare.

Literature.

Twentieth Annual Report of the Commissioner of Industry and Statistics of Rhode Island, 1906, Part III, pages 1–187, Abandoned Farms; E. F. Adams, The Modern Farmer in His Business Relations (San Francisco, 1899); E. F. Adams, Coöperation among California Farmers (The Forum, Vol. XX, page 364, 1896); D. W. Aiken, The Grange: Its Origin and Progress (Washington, 1883); W. Aldrich, Farming Corporations (New York, 1892); J. O. Armour, The Packers, the Private Car Lines, and the People (Philadelphia, 1906); Bibliographie Coöpérative Internationale (London, 1906); Coöperation among Fruit-growers (The Outlook, Vol. LXXIV, page 304, 1902); Coöperative Agriculture, (Old and New, Vol. III, page 600, 1871); A. Desjardins, Coöperation in Canada (Report of the Fifth International Coöperative Congress, 1902); P. Gilliéron-Duboux, Institutions Rurales de Crédit: les Caisses Mutuelles (Lausanne, 1906); M. Grabein, Die Wirtschaftliche Bedeutung der Deutschen Ländlichen Genossenschaften (Zeitschrift für Agrarpolitik, Vol. V., No. 6, pages 234–246); M. Grabein, Wirtschaftliche und Soziale Bedeutung der Ländlichen Genossenschaften in Deutschland (Tübingen, 1908); W. A. Hinds, American Commonwealths (Chicago, 1902); G. B. Horton, Needs and Possibilities of Organization among Farmers (Ann Arbor, 1902); W. N. Hutt, Marketing Fruit and Truck Crops (Maryland Experiment Station Bulletin No. 116, March, 1907); H. M. Jenkins, American System of Associated Dairies (Journal of the Society of Arts, Vol. XIX, page 46, 1870); L. Katscher, Landwirtschaftliche Genossenschaften in Amerika (Sociale Kultur, September, 1905); S. Leavitt, Peacemaker Grange, or Coöperative Living and Working (New York, 1881); Les Caisses de Crédit Agricole Mutuel en 1906 (Bulletin de Statistique et de Législation Comparée, Vol. XXXI, No. 8, pages 172–176); C. I. Lewis, The Apple from Orchard to Market (Oregon Experiment Station Bulletin No. 94, February, 1907); A. de Viti de Marco et al., L'Iniziativa del Re d'Italia e l'Istituto Internazionale d'Agricoltura, pages 365–397 (Rome, 1905); C. H. Matson, Grain Buyers' Trust (Review of Reviews, Vol. XXV, page 201, 1902); A. McNeill, Coöperation in the Marketing of Apples (Dairy and Cold Storage Commissioner's Series, Bulletin No. 18, Ottawa, Can., May, 1907); W. Paddock, Fruit Growers' Associations (Colorado Experiment Station Bulletin No. 122, April, 1907); E. A. Pratt, The Organization of Agriculture (London, 1904), and The Transition in Agriculture (London, 1906); J. K. Reeve, Coöperation in Agriculture (New England Magazine, new series, Vol. III, page 122, 1891); M. de Rocquigny, La Coöpération Agricole en Italie (Bulletin des Séances de la Société Nationale d'Agriculture de France, Vol. LVII, No. 8, pages 727–735); H. L. Rudloff, Die Genossenschaftsbewegung der Getreideproduzenten in den Vereinigten Staaten Nordamerikas (Fühling's Landwirtschaftliche Zeitung, Vol. LVII, May 1, 1908, pages 321–334); C. S. Sargent, Agricultural Coöperation (Garden and Forest, Vol. VIII, page 451, 1895); C. Vincent, Coöperation among Western Farmers (Arena, Vol. XXXI, page 286, 1903); H. A. Wood, Farmers' Trusts (World's Work, Vol. VI, page 3651, 1903). See articles by Hibbard, Butterfield, and the article on the following page; and articles in the agricultural press and elsewhere.

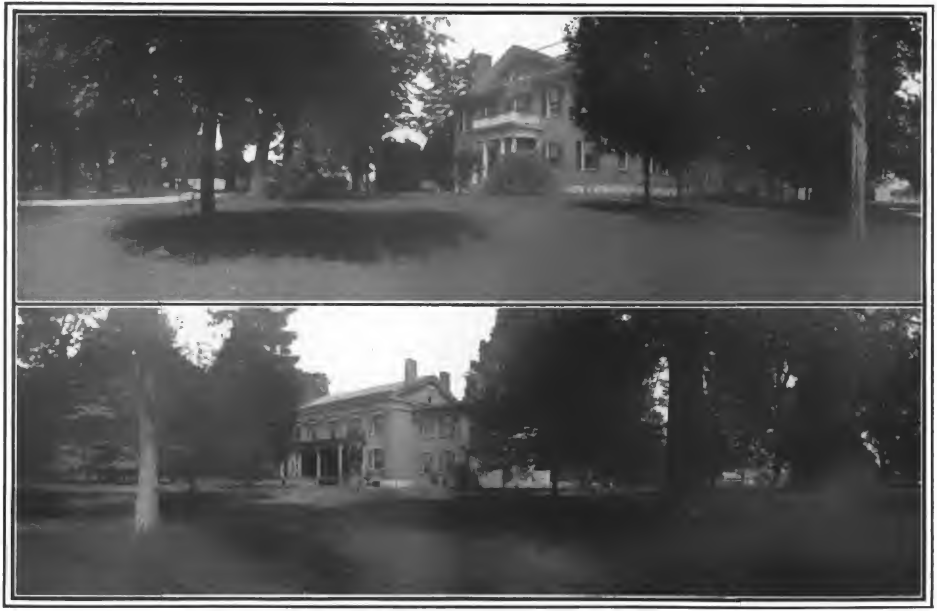

Plate XIII. Worthy farm homes. Scenes in the blue-grass region of Kentucky

COÖPERATIVE MARKETING IN FRUITS

As an example of the practical working out of a coöperative marketing system, the plan of organization of the California Fruit Growers' Exchange (page 246) is here described (by the Exchange itself). This Exchange is the successor of the Southern California Fruit Exchange. The growers in a certain territory unite in incorporated associations for the picking and packing of their fruit; and these associations, in turn unite, if contiguous, into a district exchange, and these district exchanges, of which there are thirteen, form the marketing corporation known as the California Fruit Growers' Exchange. Questions of tariff, transportation, and other matters affecting the industry, are handled through an organization called the Citrus Protective League, composed of the various Exchanges and similar corporations. Of this League, the California Fruit Growers' Exchange and others are members. This particular Exchange is here outlined only as an illustration of this type of organized effort.

History.

Oranges and lemons have been grown in California for one hundred years, but the first trees of the Washington Navel variety were set in 1874. Twenty-five years ago the annual total shipments were scarcely twenty carloads. Fifteen years ago the annual total shipments were approximately four thousand carloads, or slightly in excess of a million and a quarter boxes. Since that time there has been an increase from year to year, until the average of the last three seasons has reached the vast volume of thirty-thousand carloads, or eleven million boxes yearly. The net f. o. b. value of the crop of 1906 has been conservatively estimated at twenty million dollars. The value of the crop now in process of marketing will probably equal that of 1906.

When citrus-fruit growing in California emerged from the stage of experiment and pastime into that of profit-seeking, the problem of marketing immediately confronted the growers. They were thousands of miles from the populous centers in which their fruit must find consumers, and they had practically no home market nor agencies through which they could convert it into ready money at remunerative figures. It is true there were speculators in the field, but their offers to buy were at very low prices and only spasmodic at best. This is not strange, as these speculators were but go-betweens, and the markets being undeveloped, they could only offer for the most part to take the fruit on consignment for the grower's account. If, passing the speculator by, the grower sought relief by consigning his product to the market himself, he was little, if any, gainer. These were the conditions in the early nineties, when the citrus fruits of California orchards were less than one-tenth the present value.

Various expedients were resorted to for the betterment of these conditions. Speculators attempted to form a compact to apportion among themselves the territory where the fruit was grown, to fix maximum prices to be paid for fruit, and also to establish f. o. b. prices, regulate credits and equalize distribution in consuming markets. Growers and speculators together sought to regulate prices, consignments, and other important questions. The most disastrous year so far as net returns were concerned that the citrus-fruit industry in California has ever experienced was 1892-3. In Riverside and in all the older sections, where there was any quantity of fruit to ship at that time, account sales in "red ink" (indicating the wrong side of the ledger) were received without number. In many instances growers not only furnished their entire crop for nothing, but were also required to pay the freight and packing charges, which the gross sale of their fruit did not cover. It was frequently the case that the larger crop a grower had, the more he was indebted to his packer at the end of the season. All of these efforts to improve marketing conditions were inadequate and short-lived. In the very nature of things they could not be more than partially successful, since the interests of growers and speculators are necessarily divergent on important points. In several localities a few growers had associated themselves to secure better packing facilities, and for mutual protection. In some instances these associations marketed on a mutual basis.

As a result of this failure of speculative shippers to sell the year's crops at fair prices and particularly stimulated by the association experiences, a large percentage of the growers sought to solve the problem by an enlargement of the association idea. A convention of growers assembled at the Chamber of Commerce in Los Angeles on the fourth day of April, 1893, the declared purpose of the meeting being, "To provide for the marketing of all the citrus fruit at the lowest possible cost under uniform methods, and in a manner to secure to each grower a certain marketing of his fruit and the full average price to be obtained in the market for the entire season."

Following the recommendation of this convention of growers, organization of associations and district exchanges was effected in all the principal citrus-fruit districts, the packing to be done by the associations at cost, and the marketing through an executive committee composed of one member from each district. This arrangement for the marketing of the fruit continued during two seasons, — those of 1893-4 and 1894-5, — but not being entirely satisfactory, on October 21, 1895, the Southern California Fruit Exchange was organized, since which date the marketing of the fruit controlled by the various district exchanges and their associations has been exclusively in the hands of the Southern California Fruit Exchange, and its successor, the California Fruit Growers Exchange, except during the period of seventeen months, from April 1, 1903, to August 31, 1904, during which time the Exchange interests combined in the sale of their fruit with the principal non-exchange shipping interests under the name of the California Fruit Agency. The net results obtained during the Agency period were not satisfactory to the growers, and on September 1, 1904, the Exchange resumed the sale of the fruit it controlled, independently of any other factor.

On March 27, 1905, the California Fruit Growers' Exchange was incorporated, and on September 1 following succeeded to the business of the Southern California Fruit Exchange. This change in name being deemed advisable in order that the marketing organization itself might in name, as well as in fact, become general throughout the state rather than to remain local to Southern California.

Theory of organization.

The Exchange is founded on the theory that every member is entitled to furnish his pro rata of the fruit for shipment through his associations, and every association to its pro rata of the various markets of the country. This theory reduced to practice gives every grower his fair share, and the average price of all markets throughout the season.

Another cardinal provision of the plan is that all fruit shall be marketed on a level basis of actual cost, with all books and accounts open for inspection at the pleasure of the members.

It must be noted that the Exchange is not a trust in any sense. It neither seeks to control production, nor arbitrarily to fix prices. It does, of course, undertake, so far as possible, by a simple method of coöperation, to displace the competition of one grower with another in the matter of packing and marketing fruit. The economies that have been effected by the Exchange in the packing and selling of the fruit it controls have been factors in reducing and holding to a reasonable basis the the expense and charges for packing and for selling services to such growers as are not affiliated with the Exchange and who sell through speculative shippers.

The practice.

The Exchange system is simple, but democratic. The local association consists of a number of growers contiguously situated, who unite themselves for the purpose of preparing their fruit for market on a coöperative basis. They establish their own brands, make such rules as they may agree upon for grading, packing and pooling their fruit. Usually these associations own thoroughly equipped packing-houses.

All members are given a like privilege to pick and deliver fruit to the packing-house, where it is weighed in and properly receipted for. Every grower's fruit is separated into different grades, according to quality, and usually thereafter it goes into the common pool, and in due course takes its percentage of the returns according to grade.

Any given brand is the exclusive property of the Association using it, and the fruit under this brand is always packed in the same locality, and therefore of uniform quality. This is of great advantage in marketing, as the trade soon learns that the pack is reliable.

There are now more than eighty associations, covering every citrus-fruit district in California, and packing nearly two hundred reliable and guaranteed brands of oranges and lemons.

The several associations in a locality unite to form the local Exchange, which serves as a medium, and to a certain extent, as a buffer between the associations and the general Exchange.

Questions of purely local interest, and many real or supposed grievances, are disposed of in the local Exchange, and through it more important matters reach the general Exchange.

The California Fruit Growers' Exchange, referred to above as the general Exchange, consists of thirteen stockholders, all directors, and all selected by the local Exchanges. In other words, the several local Exchanges designate one man each from their membership as their representative, and he is elected a director of the California Fruit Growers' Exchange. By this method the policy-making and governing power of the organization remains in the hands of the local Exchanges.

The organization is planned, dominated and, in general detail controlled, by fruit-growers, and for the common good of all members. No corporation nor individual reaps from it either dividends or private gain.

Organization in the market-places.

Seeking to free itself from the shifting influences of speculative trading, by taking the business out of the hands of middlemen at home, the Exchange found it quite as important to maintain the control of its own affairs in the markets. It never contemplated the opening of either retail- or jobbing-houses, but to put the fruit into the hands of the legitimate dealers first hand. For this purpose the Exchange established a system of exclusive agencies in all the principal cities of the country, employing as agents active, capable young men of experience in the fruit business. Most of these agents are salaried, and have no other business of any kind to engage their attention, and none of the Exchange representatives handle any other citrus fruits. These agents sell to smaller cities contiguous to their headquarters, or in the territory covered by their districts.

Over all these agencies are two general or traveling agents, with authority to supervise and check up the various offices. These general agents maintain in their offices at Chicago and Omaha a complete bureau of information, through which all agents receive every day detailed information as to sales of Exchange fruit in other markets the previous day. Possessing this data, the selling agent cannot be taken advantage of as to prices. If any agent finds his market sluggish, and is unable to sell at the average prices prevailing elsewhere, he promptly advises the head office in Los Angeles, and sufficient fruit is diverted from his market to relieve it and restore prices to normal level. In actual practice, approximately 40 per cent of all the fruit shipped by the Exchange is sold at public auction at point of consumption, and of the remaining 60 per cent the greater part is sold at private sale at a price agreed upon between the seller and purchaser at point of arrival, on market conditions as they prevail at that time. Through these agencies of its own, the Exchange is able to get and transmit to its members the most trustworthy information regarding market conditions and visible supplies, affording a maximum of good service at a minimum cost.

Marketing the fruit for its growers at actual cost, the Exchange has been able to bring about a reduction in packing and selling charges, with a result that the average cost per box of both packing and marketing oranges to Exchange growers has, during recent years, averaged around 35 cents as against 50 to 75 cents per box at the time the Exchange was organized, when the charges by speculative shippers for packing alone was 40 to 50 cents per box, to which was added for selling from 7 to 10 per cent commission on the delivered price.

COÖPERATION IN THE GRAIN-ELEVATOR BUSINESS

By *B. H. Hibbard*

A type of coöperative effort that is little recognized by the general public is that associated with the elevator business. This has been an efficient coöperation, and lessons may be learned from it for other agricultural organizations.

History.

It is difficult to determine the exact beginnings of coöperation in the buying and shipping of grain. The grange of thirty or thirty-five years ago had a large number of coöperative features. Part of them have become inoperative while others, such as the farmers' mutual insurance companies, still flourish. It is reported, on fairly good authority, that over half of the elevators of Iowa were once in the hands of grange coöperators. They ran a short, swift course; short, because badly managed; swift, because of the great power behind them and the steepness of the grade down which they were moving. The grange entered into more social and educational work, and thereby found a more prosperous field.

As a rule, the farmer of that time was little schooled in the principles of business, and was easily misled by the superficial views, so prevalent, concerning the possibilities of coöperation. The new plan broke down primarily because the farmer believed that thirty or forty dollars a month would hire a man capable of doing the business. This resulted in inefficient management; the book-keeping was badly done; the grain was not properly graded; the prices paid were too high. Such companies were easy victims for well-organized, independent and line-elevators, and one after another they succumbed.

The rapid decline of the grange elevator business carried down with it the enthusiasm for coöperation; the newspapers chronicled the death of the ill-starred ventures; and a chapter of farmers' coöperation was closed. It was taken for granted by the public that the last chapter had been written; but, if it was, later events proved the assumption to have been premature. The Farmers' Alliance of the following decade gave promise of reviving the movement, but little came of it.

Certain sporadic attempts at coöperation, with no ascertainable causes for their beginnings or successes different from the usual, attracted attention during the latter part of the eighties. The most noteworthy of these was at Rockwell, Iowa. At this little town of only 500, a coöperative company of farmers undertook to buy grain and other farm produce and to sell lumber, coal, and later, general merchandise. This seemed like a small affair to the onlooker, but to those interested it was no trifling matter. It was a genuine case of monopoly *versus* citizen. It lived, but it had to fight desperately for life.

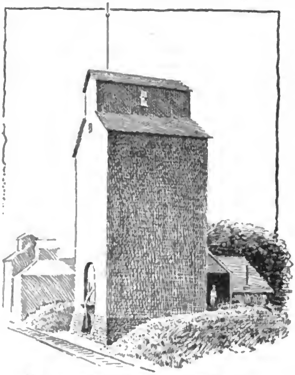

Fig. 75. Coöperative elevator at Aurelia, Iowa.

During the years following the downfall of the granger elevators, the great line-elevators had been extending their chains of houses throughout the grain-belt. A company like the new one at Rockwell was sure to attract attention, and it was not long before the competitive struggle came. To the surprise of nearly every one outside the new movement and to many within it, the battle was long and desperate, but the victory was with the farmers. It was found, on investigation, that the fight was won largely through the "maintenance clause," afterward called by the opposition the penalty clause. This provision required members of the coöperative company to pay to their own manager a fraction of a cent for every bushel of grain sold to a competitor. By this provision the overbidding of the competitor gave the farmer an added profit and, at the same time, gave the farmers' company a stipend on which to subsist.

It was some years before another company of farmers entered the grain-buying business. When they did, it was because of alleged unfair treatment from the line elevators. The independent elevators, that is to say, those owned by private individuals as distinguished from the line elevators, were not in ill-repute, except as they allied themselves with the bigger concerns. These had been organized into state associations and were naturally closely connected with the commission firms at the great terminals, and likewise on amiable terms with the railroads. When, therefore, the farmer elevators began to make inroads into the territory it was but natural that the commission firms should be induced to help discourage the new aspirants.

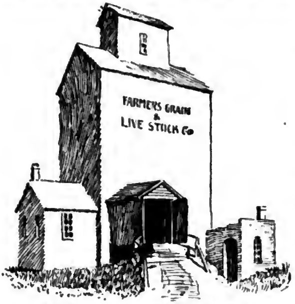

Fig. 76. The farmers' elevator at Ridgeway, Iowa.

The line companies had drawn the independents into their state organizations, and these latter organizations, styling themselves "regulars," undertook a boycott of all commission firms dealing with irregulars. Many consignments were refused. This move was a failure, for the farmer companies had much good grain for sale and it was not long before several commission firms were offering to take it. Defeated in this the regulars, according to testimony taken before the Interstate Commerce Commission at Des Moines in October, 1906, undertook to make terms with the coöperative companies by taking them into membership, requiring them to buy at prices agreed on in advance and to divide the business on a pro rata basis. This was not received favorably by the farmers, who had tasted of the fruits of victory and saw no reason for surrendering a large share of the spoils.

The railroads had given fair aid to the farmers on the whole, though making some serious trouble, as noted below. The work and power of the Interstate Commerce Commission has no doubt had its influence, as has also the hesitancy of the roads to offend the whole farmer class in the granger states.

One of the most serious difficulties has been that of getting a site for a coöperative elevator, the railroad frequently taking the position that there were already elevators enough. In several states these troubles could not become very serious owing to the legislative requirement that side-tracks should be extended to elevators and warehouses doing a certain amount of business and located within reasonable distances. In a considerable number of instances elevators were built on private land near the right of way and the side-tracks extended; in others the grain was run in spouts to the track; but more frequently the case was settled by the purchase of an elevator already doing business, the owners preferring to sell rather than compete against a coöperative company.

The present situation.

In 1902, the number of farmers' coöperative elevators was insignificant; in 1904 there were a few score; in 1907, 1,000. They have spread to Ohio, Kentucky, Indiana, Illinois, Minnesota, Iowa, Missouri, Kansas, Nebraska, both Dakotas, and Canada, with an occasional one in the mountain and Pacific states. There are in the grain-belt states at present 1,300 coöperative grain companies with a membership of about 130,000 in all.

It is difficult to say just what percentage of the grain in these states is handled by coöperative companies, as they usually handle at stations where they are located nearly all of the grain regardless of the number of competitors, and while they operate and control less than 15 per cent of all the elevator properties, it is likely that they handle 30 per cent of the grain marketed from these states. This, estimate, however, is not based on accurate figures, but is rather one based on careful observation.

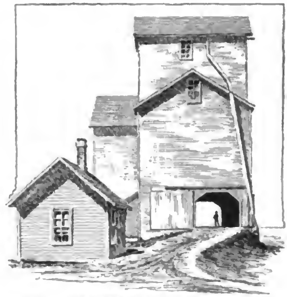

Fig. 77. The coöperative elevator at Carlock, Ill.

A company is composed of from fifty to four hundred farmers, who subscribe for shares of stock, usually at twenty-five dollars per share, the stockholders being limited to a few shares each, as one, four, five, and occasionally ten or twenty. There seems little danger that these companies will become joint stock companies and lose their coöperative features, since usually one man has but one vote in the directing of the company. These members are in almost all instances practical farmers, i. e., they get their living from actual farming operations, or, having already done so, are retired. Thus there is little danger of dominance of any outside influence.

The officers are paid a small amount annually in some instances, in others a dollar or two is allowed for every meeting of the directors or of the executive committee. The president receives twenty-five or fifty dollars a year, when paid at all, and the secretary a little more. It is in the manager that the greatest factor for success or failure is found. In this phase of the business, the farmers are showing the knowledge gained from previous mistakes, and, as a result, intelligent, experienced men are employed and a fair salary is paid. The salaries range from fifty-five to one hundred twenty-five dollars per month, with a tendency to rise even higher.

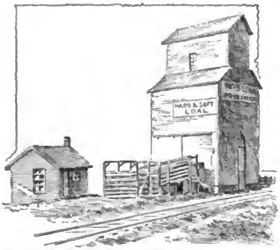

Fig. 78. Farmers' coöperative elevator, Deer Creek, Ill.

With hardly an exception, the amount of business done is far beyond the proportional amount done by competitors; this is due, no doubt, to the advantages in guaranteed business from the members; it is due very largely, however, to the smaller margin of profit on which business is done, and therefore attracts patronage from non-members. In a few towns, line elevators have almost ceased to do business, because the majority of grain sellers belong to the coöperative companies. From several hundred reports it appears that the farmer companies are each handling from forty thousand to two-thirds of a million bushels of grain per year. This, according to the same reports, is more than double the amount handled by an equal number of competing houses.

Aside from grain, about two-thirds of these enterprises include the handling of coal, on which fifty cents to a dollar and a half per ton is saved to the customer. Twine, oil, brick, tile, feed, seeds, and lumber are also dealt in occasionally, and, on these, important savings are effected. Live-stock shipping less frequently is undertaken, and here the gains are likely to be offset by losses since this is a business subject to severe competition.

The results of this coöperative movement are variously interpreted according to the interests and sympathies of the interpreter. Financially the results seem flattering. Some companies do business on a close margin, depending on the assets of the members to meet emergencies. Others accumulate a good surplus. As a rule the stockholders get at least nominal interest on the investment; however, the cases are not rare in which ten to a hundred per cent dividends are paid. The main source of profit is not the dividend, but the added price received for the grain. The farmers invariably report increased prices over those paid in towns in which there is no coöperative company. The reported increase varies from one to ten cents per bushel, and averages about three cents.

The question is frequently asked whether or not a coöperative company of this sort may not have a bad effect on the general prosperity of a town. When the business is in the hands of a local independent dealer, the prosperity of the community could not be advanced by putting him out of business. But, and this is more often the case, when a line company is handling the grain, the profits are withdrawn from the community as fast as made and invested or spent in some distant state or city. The local newspaper editors testify generally to the good effect of farmers' companies in upbuilding the towns.

The whole movement seems to be an attempt on the part of an important class of producers to scale down the wide margin between the farm prices of produce and the prices paid by the consumers for the same. It is an effort to eliminate so far as possible the necessity of paying profits to a class of middlemen. So far as one can judge at present the effort seems likely to continue, since it is meeting with such marked success.

AGRICULTURAL CREDIT

By *E. W. Kemmerer*

The word "credit," like most words of common usage, has a variety of meanings. In all of them, however, two ideas are contained, that of a postponed payment, and that of confidence or trust placed in some one. When we say a man has credit, we mean that others are willing to entrust property to him without immediate compensation, and that they have confidence in his ability and willingness to return an equivalent, with interest, at a future time. A person who possesses good credit can obtain, by the payment of a small interest charge, the use of the capital of others up to many times the value of his own capital, and by its wise use in productive enterprise can usually obtain a return sufficient to repay principal and interest, and to realize in addition a substantial profit for himself. Such transactions are of benefit to both parties. The creditor benefits because he has capital at his disposal which he does not care himself to use directly in productive enterprises and for the loaning of which he is glad to receive a compensation; the borrower, on the other hand, is glad to pay for the use of such capital, because he can invest productively more capital than he himself possesses, and thereby increase his profits.

Extensive use of credit in business.

Few people realize the enormous development of credit that has taken place in civilized countries within recent years. Probably the greater part of the business of Europe and America is today done by means of borrowed capital. In the fields of manufacturing industry and of commerce it is the rule, rather than the exception, to do business largely on credit. The money that has built our railroads, steamship lines, and great manufacturing enterprises was largely borrowed by means of bonds, the owners of the enterprises expecting to pay for the plant, i. e., pay off the bonds, from the profits to be realized.

The manufacturer gives his promissory note for the raw material he purchases, and pays the note at maturity out of the proceeds obtained from the sale of the products. The merchant buys merchandise largely on credit, and pays for the goods bought, by the funds obtained from their sale. The exporter obtains money from the bank on the security of his own credit, and that of the very products for which he expends the money borrowed. He settles his account by turning over to the bank the bills of exchange which he draws against the goods at the time of shipment; the the consignee abroad, if his credit is good, is frequently given the bill of lading upon the acceptance of the bill of exchange, in which case he sells the goods, and pays the bill at maturity out of the proceeds of their sale. In case the bill of lading is not delivered to him by the bank until payment is made, he frequently obtains the means of payment by borrowing money on two- or three-name paper, or on the pledge of collateral.

The speculative business on our produce and stock exchanges is done almost entirely on credit, the stocks or produce purchased being pledged as security for the use of the purchase money, and a small margin being deposited to protect the bank against possible depreciation of security. Most bank deposits in commercial banks are the proceeds of loans granted by the banks, and amounting to many times the banks' own capital or the banks' cash reserves. It is estimated that 75 per cent of the business of the United States is transacted by means of checks. The bank deposits of the great European banks are estimated to turn over from 120 to 165 times a year, and the rate of turnover probably averages larger in the United States than in Europe.

Small use of credit in agriculture.

This wonderful development of credit, which greatly cheapens capital and multiplies its efficiency, has been widely taken advantage of in the United States by every important branch of productive enterprise but one, and that one is agriculture. It is not meant to say that credit is not being utilized in agriculture, but that it is not being utilized anything like as much as in other lines of production. Moreover, what use it is receiving in the United States is much more largely in the form of mortgage credit for the purchase of farms than in that of strictly agricultural credit to provide capital for agricultural business, such as for farm improvements, agricultural implements, live-stock, fertilizer, and the like. It is not short-time credit, analogous to that used by the business man for carrying on his current business, but rather long-time credit, like that used by railroads in the sale of bonds to raise capital for the building or extension of the roads. It is used for buying farms rather than to obtain capital to successfully work them.

Some reasons for small use of credit in agriculture.

Why then, we may ask, has credit been so backward in extending itself to ordinary agricultural business? Is it, as some have claimed, because the farmer does not need such credit? Certainly the farmer should not borrow if he has sufficient funds of his own to work his farm at maximum productivity. Borrowing, like buying, is a business proposition. The farmer should resort to it only when he is convinced that he can use additional capital so productively that it will be made to reproduce itself, principal and interest, and yield a substantial profit, besides.

But what thrifty farmer could not use profitably some additional capital every year if he could obtain it at a reasonable interest rate? On nearly every farm there are demands for improvements for which cheap capital could be profitably employed. There are forests to be cleared, fields to be drained or fertilized, cattle or farm implements to be bought, and a dozen other improvements that would yield returns sufficient to justify borrowing, if the rate of interest were low and the terms of the loan otherwise reasonable.

There are certain obvious reasons why credit facilities have been slow in being extended to agriculture, and especially slow in the United States, among which may be mentioned the following:

(1) In farming districts the population is so widely scattered that a bank finds difficulty in extending its business over a sufficient territory to make it profitable.

(2) The credit period ordinarily desired by a farmer seeking a loan for agricultural purposes, is too long for a commercial bank which wishes to turn over its capital rapidly, and is reluctant to make loans for a longer period than three or four months; the credit period, on the other hand, is too short for savings banks, insurance companies, and other similar institutions that are looking for permanent investments, and prefer credit periods running over a considerable number of years, like those of real-estate mortgages and railroad bonds.

(3) A third reason is that farmers in the United States have not required anything like as large a percentage of working capital to their total prod-

ucts, as have most producers in other lines, or as have the farmers in European countries. Good land has been plentiful and cheap, so cheap that it has not been profitable to cultivate it intensively and to put a large amount of capital in improvements.

(4) A fourth reason, and perhaps the most important one, consists in the risks that are supposed to be inherent in agricultural loans. About one-third of the farms in the United States are operated by tenants, and about one-fifth of them are mortgaged. Titles to ownership are frequently not sure. Prospective crops because of their uncertainty are not a safe security for loans. Crops vary greatly from season to season, both in amount and in value, as the result of rainfall, temperature, pests, and supplies in other parts of the United States, and in foreign countries,—conditions over which the local farmer has little or no control. Crop and cattle insurance unfortunately have made little or no progress in this country and agricultural risks cannot readily be guarded against.

Probable increase in the demand for agricultural credit.

To state some of the reasons that have prevented the extension of credit facilities to farmers throughout the United States is to suggest that they are rapidly losing their force. As population increases and cities and towns grow in size and in number the value of land and of agricultural products tends to rise, and in consequence it becomes necessary to cultivate more intensively and to invest a continually increasing amount of capital in agricultural improvements and operations. Farming must become more and more of a business in which exacting business methods are employed, and in proportion as it becomes so will it require business man's credit in order that it may be efficiently and profitably carried on.

The rather long credit period needed for agricultural loans is liable to offer less and less of an obstacle. As the supply of capital in the country increases, the need for agricultural credit becomes greater, so as to offer a larger field for agricultural loan business. The recent developments that have been bringing the farming population more closely together, such as better roads, rural free delivery, and rural telephone service, are lessening the obstacle to agricultural credit which has so long existed in the fact that the farming population has been widely scattered. Our rapidly increasing knowledge of scientific agriculture, and of methods of preventing the failure or destruction of crops by blights and pests, and the wider diffusion of this knowledge, are making the risks of crop failure and the loss of cattle by disease, less every year; while the growth of crop and cattle insurance may confidently be hoped for as a factor in the future by means of which the farmer or his creditor can protect himself against many of the uncertainties that remain.

The conclusion seems warranted that the demands for agricultural credit are increasing, and that the obstacles which have heretofore prevented the growth of agricultural credit are disappearing.

METHODS OF PROVIDING AGRICULTURAL CREDIT

The question then presents itself as to how agricultural credit is to be provided. Such credit is more thoroughly developed in continental Europe, and even in parts of Africa and Asia than in the United States. A brief review of some of the more important plans that have been tried in these countries will make clear the problems existing in the United States.

There may be mentioned four main classes of agricultural banks, in each of which there are a number of varieties. The four classes are: (1) Private banks. (2) Government banks that are financed either entirely or largely with government funds, and in the management of which the government largely participates. (3) Private banks under government financial guarantee. (4) Co-operative banks managed by the farmers themselves, and provided with funds largely by borrowing on the security of the joint personal liability of the members, for whose benefit the banks exist.

Private banks

The first and most natural method of meeting the need for agricultural credit is by means of ordinary banks, conducted by private enterprise. Such banks in most of the countries of Europe and of America do a large business in making advances to farmers on mortgage security. In Europe they are commonly organized on the debenture plan, as, for example, the Hypotheken Banks of Germany and the Credit Foncier of France. They raise their money by the issue of long-time debentures secured by their own capital and by the mass of mortgages that they hold. Loans are made for a long period of years, on the security of mortgages, on property generally of at least twice the value of the loan. Repayments are made by annuities covering the interest and part of the principal.

Banks of this type do a very large business throughout Europe, and their debentures generally have a high standing in the money markets. Governments exercise over them a careful supervision and control. Mortgage banks operating on the debenture plan, while not unknown in the United States, have never attained the importance here that they have in most European countries. The demand for mortgage credit in the United States is met principally by our savings banks, state banks, private banks, loan and trust companies, and insurance companies.

The banks in continental United States reporting to the Comptroller of the Currency, for the year 1907 had loans outstanding on real estate to the amount of $1,769,000,000, a large part of which—the report does not say how much—is represented by loans on farm mortgages.

Mortgage loans, while satisfactory as a method of raising funds for the purchase of land, and the erection of expensive buildings, are not an appropriate means for borrowing money for small agricultural improvements, equipment and running expenses.

The ordinary commercial banks, which do the major part of the banking business in Europe and America, desire to turn their capital over more rapidly than the requirements of agricultural credit will permit. Moreover, they are frequently, as in the case of the national banks of the United States, forbidden by law from making loans on real estate security. Of course commercial banks, particularly those situated in the smaller cities, do frequently make advances to farmers for agricultural purposes, on personal security. The advances being made for periods of three to six months, and then renewed for several times. Such loans, however, are few, relative to the demands of agriculture, and largely limited to well-to-do farmers.

It is safe to say that neither in our own, nor in any other civilized country, are the needs for purely agricultural credit being adequately met by private enterprise.

Government agricultural banks.

Little need be said concerning the second type of agricultural banks,—the government banks. Such institutions were established frequently during the last century by European governments and by American states, with the object of aiding agriculture, and releasing farmers from the clutches of usurers. Several government banks exist today and are performing a useful service to agriculture, prominent among which may be mentioned those of the Australian states and of New Zealand. These banks are more properly mortgage banks than strictly agricultural banks, for the bulk of their loans are made on mortgage security. Funds are raised usually by the issuance of government bonds, the banks are administered by government officials, and loans are made usually for a considerable term of years. Government banks exist in some of the petty principalities of Germany and in some of the communes of Switzerland.

Examples of earlier government agricultural banks are Le Crédit Agricole, in France, which proved a failure, the Belgian attempt to loan the deposits of national savings banks for the benefit of agriculture, and the similar attempt in Italy, both of which failed. In our own country, during the colonial period, a number of the colonies sought to aid agriculture (and other forms of enterprise) by loaning to the public government bills of credit, which circulated as money. The bills were principally loaned to people with political influence, were issued in large quantities, greatly depreciated in value, and were seldom paid back. During the third and fourth decades of the last century, when the mania for state expenditures for internal improvements swept over the country, a number of states, including Louisiana, Mississippi and Arkansas, established banks with the primary object of loaning public funds to agriculturists. These banks all came to an unhappy end, and a large part of the funds loaned was lost.

With few exceptions the government agricultural banks of the last century both in Europe and America were failures. Mr. F. W. Nicholson[1] sums up the experience with government banks by saying: "The history of rural banking shows that no state bank has ever yet succeeded, except in very petty states, where the administrative staff is out of all proportion—relatively to large states—to the work to be done and the area to be covered by it, or where the communes are linked to the central organization by peculiar arrangements, or where the banks are not credit banks at all, but mere offices of issue of loans either upon the results of the inquiries of special commissions, as in the case of the German rent charge banks, or upon the security of communal organizations which deal with all details, as in the case of the Russian peasants' land bank, founded to enable the ex-serfs to buy out the land settled upon by them. There are no state land banks in great states dealing with the continuous yet fluctuating credit required by a cultivating peasantry."

The principal dangers of such government banks in our own country are that they will get into politics, that loans will be made to persons who can bring the most political pressure to bear, and that the bank will find it impossible to enforce its collections. Neither elected nor appointed public officers are in position to pass judgment upon applications made by their neighbors for loans of public funds, granting some and refusing others.

The Egyptian plan.

The third plan, that of a private institution, financed with private capital, but under a government guaranty, seeks to eliminate the evils of a purely government bank, and to take advantage of its meritorious features. The best and most successful example of this type of institution is the Agricultural Bank of Egypt, which had its origin only a few years ago. It was established as the result of an attempt on the part of the Egyptian government to aid agriculture, and to enable the peasants to free themselves from the fearful burdens that usurers had imposed upon them.

The Egyptian authorities, particularly the Earl of Cromer, who was virtually Egypt's chief executive, had made repeated efforts to induce private individuals to establish agricultural banks which should make small loans to the peasantry on reasonable terms. Private capitalists, however, were fearful of the risks and heavy administrative expenses involved in such an enterprise, and would not undertake it. Finally the Government decided to experiment for itself.

During the years 1894 to 1896 inclusive, it made certain advances of seed to the peasants to be paid for in three equal installments at harvest time. The seed was much better in quality and cheaper in price than that which the peasants could buy in the market. So successful was the experiment, that the Government soon undertook the loaning of money. Loans were made in small amounts—no individual receiving more than fifty dollars—and were made payable at harvest time. Between February and July 1896, persons owning in the aggregate 4665 acres of land borrowed $38,500. This number included 1113 cultivators of less than five acres. With the exception of $100 the entire capital and interest was repaid by the end of November. The government exercised unusual care in making advances only to responsible persons.

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[1] Report on the Possibility of Introducing Land and Agricultural Banks into the Madras Presidency.

In 1898, the National Bank of Egypt was established, one of the main reasons that induced the government to assent to its creation being its desire to facilitate the extension of agricultural loans to the peasants. Such loans were to be an important feature of the bank's business. The bank at first limited its agricultural loan operations to one district. Small advances in sums not over $100 were made in the spring, payable after the harvesting of the cotton-crop in the fall, and larger advances in sums up to $500 were made repayable in five annual installments to those wishing to pay off old usurious debts.

Arrangements were made with the government according to which the government tax collectors were to collect the payments on the loans at the time of collecting the regular land tax, thus saving the bank the expense of hiring a large force of collectors. The tax collectors were paid by the bank a small commission on their collections. By February, 1902, the bank's outstanding loans to the peasants numbered 15,269 of which 3,326 were for small loans on personal or crop security repayable within the year, and 11,943 for larger loans on mortgage security repayable during a period of years, in annual installments.

By this time, the mortgage and agricultural loans of the National Bank of Egypt had grown to such proportions that it became necessary for this department to separate from the parent bank, and to become organized as a distinct institution under the name of the Agricultural Bank of Egypt.

The new bank continues to utilize the services of government tax collectors in the collection of its loans, and of certain other government officials, and enjoys a government guarantee of principal and of interest at 3 per cent on the capital invested in mortgage and agricultural loans. These two privileges are the distinctive features of the Agricultural Bank of Egypt.

The bank's loans are divided into two classes: the first class known as "A" loans are strictly agricultural loans and consist of advances varying in size from $2.50 to $100, payable with interest the following crop season (provided they are made more than three months before that season, otherwise the next following crop season). The second class, known as "B" loans, consists of loans varying in amount from $100 to $2,500. They are secured by first mortgage on land worth at least double the amount of the loan, and are repayable in annuities covering principal and interest, running for a period not to exceed twenty and a half years. The interest charged is 8 per cent—a rate which, though high in itself, is much lower than the 25, 50 or 100 per cent rates that formerly prevailed on such loans.

The bank has had a phenomenal success. From December 31, 1902, to March 31, 1906, the amount of outstanding loans increased from $6,041,000 to $35,167,430, and the number from 46,572 to 185,530. About 12 per cent of the number of loans and 3 per cent of the amount loaned is represented by strictly agricultural loans and the balance by mortgage loans. The average size of the agricultural loans is about $45 and of the mortgage loans is about $175. The usurer has been either driven out or forced to give much more reasonable terms, and the bank has been of incalculable benefit to the Egyptian peasantry.

It has been equally successful from a business point of view, for it is not a philanthropic enterprise. From June, 1902, to March, 1907, the paid-up stock and debenture capital of the Bank increased from $6,250,000 to $36,200,000. It has paid good dividends every year and accumulated a substantial surplus. Its stocks stand well in the market, the common stock being at the present time (July 31, 1908) quoted at a premium of 50 per cent. It has had practically no losses from bad debts, and has never called upon the government to make good a cent of its guarantee. This is certainly a striking record for ten years' business covering hundreds of thousands of small loans to an ignorant peasant population.

A bank organized on the Egyptian plan is particularly useful to do pioneer work among ignorant farmers where the apparent risks and heavy administrative expenses prevent private capital from entering the field. It is this type of a bank that has recently been authorized by Congress for the Philippine islands.

Coöperative agricultural banks.

The fourth type of agricultural bank mentioned in our classification is that of coöperative banks or coöperative credit societies. The history of such institutions dates from about the middle of the last century, and they have been limited pretty largely to continental Europe, although they are at present to be found in Great Britain, India, Canada and the West Indies. There are several important classes of these banks, and in each class there are variations in the details of organization. They are all modeled, however, on the same general plan, and, with few exceptions, have the following characteristics in common:

(1) They are coöperative associations managed by and for the members.

(2) The members are jointly liable for the debts of the association, and their liability is frequently unlimited.

(3) Funds are obtained, in part, from deposits of members and others and, in part, from the purchase of stock by members (although a large proportion of the banks do not have any appreciable share capital), but principally by borrowing from outside.

(4) Loans are made only to members and that for productive purposes.

(5) The rate of interest is kept as low as possible, consistently, with the accumulation of a substantial reserve fund.

(6) Loans are granted only on the vote of an elected committee which is responsible to the gen-

eral meeting of members, at which every member has but one vote.

(7) The principal security required is personal—that is to say, the responsibility of the borrower and one or two responsible neighbors who sign with him, although pledges of crops, cattle, bank shares and even land mortgages are sometimes accepted.

(8) Repayments of small loans are made in one payment, those of larger ones in annuities covering an installment of the principal and the annual interest.

(9) The local banks are generally united, and centralized in a District Union, with a district bank at the head, the District Unions in turn being united in a national union crowned by a central bank.

(10) There is a careful system of checking and audit exercised by local committees, and by officers of the district and national unions.

(11) Most banks either directly or, more commonly, through allied organizations, assist their members in the coöperative purchase of supplies and sale of produce.

The Raiffeisen coöperative banks.

The most typical and, in many ways, the most successful of these systems of coöperative banks, although not the largest, is the Raiffeisen system.

F. W. Raiffeisen, the founder of the system, during the famine years of 1846 and 1847, was Burgomaster of Flammersfeld, in the forest district of Westerwald. He witnessed the fearful sufferings of the peasant cultivators during this famine period, and the intolerable impositions of the Jewish and Christian money lenders. The miseries of the poor peasants strongly appealed to his sympathies, and he determined to alleviate their distress. With much difficulty he gathered together enough funds to establish a coöperative bakery, through which the peasants were enabled to purchase their bread at about half the current price. This was followed by a coöperative cattle-purchase association which likewise proved a success.

Finally, having succeeded in raising $1,500, he established at Flammersfeld, in 1849, his first coöperative loan bank (Darlenkasse), and offered to loan money at a low rate of interest, for agricultural purposes, to those peasants who would comply with the rules he laid down. The bank succeeded, and five years later a second bank was established by Raiffeisen, this time in the district of Heddesdorf, in which he had been appointed Burgomaster. The third Raiffeisen bank was not established until 1862, and the fourth until 1882. The banks thus extended very slowly at the beginning, and gave little promise of the great future they were to have.

The Raiffeisen system as it exists today is the same, in all of its essentials, as that worked out with such care by its founder for these early banks. Its foundation stone is the confidence Raiffeisen had in the honesty and thrift of the German peasants. He reasoned that money could be borrowed for agriculture, just as it was being borrowed for other lines of business, at reasonable rates, provided, only, ample security could be given. His great confidence in the people convinced him that by uniting a selected group on the principle of coöperation, under unlimited liability, he could capitalize their honesty and thrift into a security that would enable the association to borrow ample funds at the market rate of interest. In other words, small farmers were to unite and, by means of their joint and several liability, were to obtain the credit that none of them possessed individually.

Each Raiffeisen bank is limited in its operations to a very small area, in which all the farmers are acquainted. A bank's field of business, Raiffeisen believed, should not cover a parish of less than 400 people, or of more than 1500. Membership is obtained only by election by those already members—a necessary provision if every member is to be responsible to the amount of his entire property for the loans made to other members.

No purchase of stock was originally required for membership,—in fact the early banks did not issue stock,—it being reasoned that it would be absurd to require the expenditure of money for that purpose by poor farmers who were joining the association primarily as a means of obtaining much-needed capital. Subsequent decisions of the courts have made it necessary for the banks in many places to issue share capital. This formal requirement is usually met by the issue of a small number of low-priced shares of which no member can hold more than one, and on which the rate of dividend is strictly limited. The bank's officers serve without compensation (except for a small allowance to the cashier who has no vote in the making of loans), and the greatest care is taken to prevent the bank from being to any one a direct money-making enterprise.

The principal reserve fund (Stiftungsfund) in which must be placed two-thirds of the annual profits, is made indivisible and cannot be distributed among the members, even though the bank be dissolved. In such a case, it must be placed in trust for a number of years for the use of a new bank, should such a one be established in the community; if no such bank is established, the fund must be used for some work of public utility.

The bank's management is made absolutely democratic, the final authority on all local questions being the general meeting in which every member has one vote. There is elected at the annual meeting an administrative committee usually of five members charged with the bank's executive work, and a council of supervision consisting of from six to nine members, whose duties are to act as a check upon the administrative committee. Each bank is subjected to a thorough biennial audit by an expert sent out by the district or central union. The books of the bank, except the individual deposit accounts, are open to the inspection of all members. With the Raiffeisen banks, poverty is no obstacle to the obtaining of a loan, provided only the applicant is honest and industrious and can show a profitable use for the money. The only security normally required is the promise of the applicant backed by the indorsement of one or two responsible neighbors.

As soon as a sufficient number of banks are established in a district, they unite to form a District Union, which looks out for the common interests of all the local banks in the district, and which by reason of the unlimited liability of the constituent banks, and of the possession of a reserve fund of its own is able to borrow money on better terms than are the local banks individually. The various District Unions are in turn united into a Central Bank which has its own administrative council and annual general meeting. The Central Bank in Germany is a joint stock company with limited liability, and has its headquarters in Neuwied, with twelve or more branches scattered in different parts of the empire Within recent years the Prussian government has established with public funds a Prussian State Bank with the primary object of assisting the coöperative banks in the obtaining of funds.

Other coöperative banks.

The Schulze-Delitzsch banks which had their origin in Germany at about the same time as the Raiffeisen banks, and which do a larger business than any other system of coöperative banks, differ from the Raiffeisen banks principally in the following particulars: They deal with a much wealthier class of people; a large part of their loans are for commercial and industrial purposes; they work principally in the cities and in large agricultural districts frequently having a membership of many thousands representing a great variety of trades and professions; their average loans are much larger than those of the Raiffeisen banks; they raise their funds to a greater extent by the issue of shares; the liability of their members is more frequently limited than unlimited; they pay their officers substantial salaries; and they depend more upon collateral security and less upon the personal credit of borrowers than do the Raiffeisen banks. In most other respects, the two systems are essentially the same. The Schulze-Delitzsch banks are thus primarily the banks of the middle-class business men, farmers and wage-earners; the Raiffeisen banks are almost exclusively the banks of the small farmers.

Italy, for whose farmers and traders coöperative banks have accomplished remarkable results, has the two systems in somewhat modified forms; the Banche Popolari being the offspring of the Schulze-Delitzsch banks of Germany, and the Casse Rurale being the offspring of the Raiffeisen banks.

The success of coöperative banks.

It would be difficult to paint too vividly the success of European coöperative banks. Of this statement, one of the best proofs is their remarkable growth. Although having a history of less than sixty years, coöperative credit has been extended to nearly every country of Europe as well as to India, Canada and the West Indies. There are no satisfactory statistics available covering the business done by all coöperative banks, but the following rather disconnected figures will afford some idea of the proportions their business has assumed. In 1905, there were in Germany alone 1,020 Schulze-Delitzsch banks and 13,181 Raiffeisen banks. The Schulze-Delitzsch banks had a membership of 586,595 persons and granted credit in 1905 to the amount of $700,000,000; the 10,706 of the Raiffeisen banks which were included in the central organization of the Imperial Union had a membership of 954,473 persons and granted credit during the same year to the amount of $115,000,000.

Dr. Felix Hecht, a high authority on the subject, estimated the amount of more or less coöperative mortgage liability outstanding in continental Europe in 1897 at about $4,600,000,000. No idea, however, of the financial services rendered the community by these banks can be given by figures of this kind, for a large proportion of the loans made are for small amounts to people who could not have obtained credit elsewhere and to whom a few dollars have an exceptionally high value. Moreover, the success of these banks has driven out usurers and made it possible for many to obtain loans of private institutions and individuals at much lower rates than formerly.

More important than the financial services of these banks have been their educational services. They have been a potent force in the intellectual and moral education of the European farmer and tradesman. The savings departments have encouraged thrift, the members have received valuable business training in the management of the banks; while the facts that membership is obtainable only by election, that loans are granted only on the approval of committees elected by the members, and that all the members are jointly liable for the debts of the bank—frequently to an unlimited extent,—have placed a premium upon business honesty and thrift in every community where there is a bank. The dishonest and lazy are denied the privileges of the bank. Members are forced by the pressure of an exacting public opinion to meet their obligations to the bank promptly. Every member is the guardian of every other for he is in part responsible for every borrower's debts. The bank's loss is his loss. This pressure of public opinion is stronger in the banks in which the principle of unlimited liability prevails, but it is present in all. Said a member of the first rural coöperative credit society in Italy: "We are a hundred persons, who watch one another like spies; it is not possible that any one of us should fail in his duty." The practice of working together in the management of these local coöperative banks has created a common interest, and a mutual sympathy and understanding among the people of thousands of communities the value of which it would be difficult to overestimate.

Agricultural credit in the United States.

It is not within the scope of this article to attempt the difficult task of formulating a plan for the extension of agricultural credit facilities in the United States. The preceding discussion has shown the characteristic features of the four principal types of agricultural banks, and some of the conditions under which they have succeeded and failed. In a country of such varied agricultural conditions as the United States it is obviously impossible to formulate any one plan suitable to all communities: moreover, the systems above outlined are not mutually exclusive, one system may suit best one class of the population in a given community, and an entirely different system another. The weight of the evidence from the experience of this and other countries seems to be against government banks. The presumption is furthermore always against the government's undertaking such an enterprise until other methods have been fairly tried.

In favor of the Egyptian plan the evidence is much stronger. Aside from the important question of constitutionality, however, it is very doubtful whether the government guaranty, which is the characteristic feature of this plan, is necessary in our own country to induce capital to enter the field of agricultural banking. Such a guaranty may be necessary to attract capital in the case of an ignorant peasantry like that of Egypt, but would hardly seem to be required in the case of a highly intelligent, thrifty, and honest farming population like that of the greater part of the United States. If the agricultural population of Europe can obtain ample credit by means of banding together on the coöperative principle, and pledging their joint liability as security, the presumption is that the more intelligent and prosperous American farmers could do the same. At least, not until a reasonable attempt has been made to provide agricultural credit on the coöperative plan would the American farmer be justified in asking for a government bank or even a government guaranty.

Literature.

H. D. Macleod, The Theory of Credit; F. A. Nicholson, Report Regarding the Possibility of Introducing Land and Agricultural Banks into the Madras Presidency; E. W. Kemmerer, Report Concerning the Advisability of Establishing a Government Agricultural Bank in the Philippine Islands and Report on the Agricultural Bank of Egypt; Henry W. Wolff, People's Banks: A Record of Social and Economic Success; and Coöperative Banking, Its Principles and Practice, with a Chapter on Coöperative Mortgage-Credit; W. G. Sumner, A History of Banking in the United States; G. Marchet, article on Darlenkassenvereine in Conrad's Handworterbuch der Staatswissenschaften.

CHAPTER VII

SOCIAL AND SERVICE ASSOCIATION

GETTING TOGETHER on all questions that affect the welfare of the neighborhood is essential to the most attractive and productive country life. This coming together not only contributes to good understanding, but it sets new ideas in motion and stimulates enterprise. When the coming together has for its purpose the improvement of buying and selling, it is a commercial, trade or economic association; when it endeavors primarily to promote other interests, as schools, churches, libraries, reading-clubs, institutes, care and adornment of the landscape, civic improvement, household betterment, it is a social association. The former kind of association is discussed in Chapter VI; the latter in the present chapter. There is really no definite line of separation between these kinds of associative effort, however. Social or educational results flow from all business organizations, in greater or less degree; social groups lead into the discussion of trade conditions; and some association, as the good roads movement, is at once both trade and social. Yet there may be a distinction of initial purpose in the two kinds of effort, and, for convenience of treatment, we may here consider them separately.

The last chapter and this will show how extensive are the agricultural and country life organizations in Canada and the United States. Aside from those that are mentioned in these pages, are great numbers of county and other small associations. It is the strictly local and neighborhood societies that need specially to be encouraged. These societies are relatively not numerous in the open country. The state and regional societies are in reach of comparatively few persons. A great proportion of the attendants at these large societies are delegates whose expenses are paid or those who are habitual organization men. Those who habitually remain at home need to be reached; and they will find their proper expression in the neighborhood group. Although the progress has been great, the large number of named organizations does not indicate that the associative sense is yet highly developed, at least not in the ultimate communities.

We need also to emphasize the importance of a continuous functioning of societies. Many of the organizations listed in these chapters meet only once or twice a year. They are organized conventions. The most effective organizations are those that are constantly at work, even though at no time do they attract much attention. A continuing organization is a kind of coöperative school for its members, and it influences others.

Protecting and saving the gifts of nature.

All satisfying and effective country life depends on pride of calling and on an appreciation of the resources that nature has placed at our command. The farmer deals directly with these resources,—soil, water, plants, animals; on these four, with what there is in the mines, rests all the welfare of mankind. We have been wasting these resources.

The necessity of saving the natural material resources and of economizing in the use of them has long been recognized by wise farmers and others. It is now receiving great public recognition in the United States. The results are to be brought about by means of association. The formal official recognition of this kind of effort began by the appointment by President Roosevelt of the Inland Waterways Commission, March 14, 1907. Under the leadership of Gifford Pinchot, Chief of the Forest Service of the United States Department of Agriculture, this Commission called attention to the necessity of an organized movement to protect the bases of our prosperity. The result was the calling of a Conference of Governors and "men from each state chosen for their special acquaintance with the terms of the problem," at the White House, in Washington, in May, 1908, "to consider the question of the conservation and use of the great fundamental sources of wealth." In opening this great Conference, President Roosevelt gave the following expression of the object of the meeting:

"This conference on the conservation of natural resources is in effect a meeting of the representatives of all the people of the United States called to consider the weightiest problem now before the Nation; and the occasion for the meeting lies in the fact that the natural resources of our country are in danger of exhaustion if we permit the old wasteful methods of exploiting them longer to continue.

"With the rise of peoples from savagery to civilization, and with the consequent growth in the extent and variety of the needs of the average man, there comes a steadily increasing growth of the amount demanded by this average man from the actual resources of the country. Yet, rather curiously, at the same time the average man is apt to lose his realization of this dependence upon nature."

"This Nation began with the belief that its landed possessions were illimitable and capable of supporting all the people who might care to make our country their home; but already the limit of unsettled land is in sight, and indeed but little land fitted for agriculture now remains unoccupied save what can be reclaimed by irrigation and drainage. We began with an unapproached heritage of forests; more than half of the timber is gone. We began with coal fields more extensive than those of any other nation and with iron ores regarded as inexhaustible, and many experts now declare that the end of both iron and coal is in sight.

"The mere increase in our consumption of coal during 1907 over 1906 exceeded the total consumption in 1876, the Centennial year. The enormous stores of mineral oil and gas are largely gone. Our natural waterways are not gone, but they have been so injured by neglect, and by the division of responsibility and utter lack of system in dealing with them, that there is less navigation on them now than there was fifty years ago. Finally, we began with soils of unexampled fertility and we have so impoverished them by injudicious use and by failing to check erosion that their crop-producing power is diminishing instead of increasing. In a word, we have thoughtlessly, and to a large degree unnecessarily, diminished the resources upon which not only our prosperity but the prosperity of our children must always depend.

"We have become great because of the lavish use of our resources and we have just reason to be proud of our growth. But the time has come to inquire seriously what will happen when our forests are gone, when the coal, the iron, the oil, and the gas are exhausted, when the soils shall have been still further impoverished and washed into the streams, polluting the rivers, denuding the fields, and obstructing navigation. These questions do not relate only to the next century or to the next generation. It is time for us now as a Nation to exercise the same reasonable foresight in dealing with our great natural resources that would be shown by any prudent man in conserving and widely using the property which contains the assurance of well-being for himself and his children."

"Neither the primitive man nor the pioneer was aware of any duty to posterity in dealing with the renewable resources. When the American settler felled the forests, he felt that there was plenty of forest left for the sons who came after him. When he exausted the soil of his farm he felt that his son could go West and take up another. So it was with his immediate successors. When the soil-wash from the farmer's fields choked the neighboring river he thought only of using the railway rather than boats for moving his produce and supplies.

"Now all this is changed. On the average, the son of the farmer of today must make his living on his father's farm. There is no difficulty in doing this if the father will exercise wisdom. No wise use of a farm exhausts its fertility. So with the forests. We are over the verge of a timber famine in this country, and it is unpardonable for the Nation or the States to permit any further cutting of our timber save in accordance with a system which will provide that the next generation shall see the timber increased instead of diminished. Moreover, we can add enormous tracts of the most valuable possible agricultural land to the national domain by irrigation in the arid and semi-arid regions and by drainage of great tracts of swamp land in the humid regions. We can enormously increase our transportation facilities by the canalization of our rivers so as to complete a great system of waterways on the Pacific, Atlantic, and Gulf coasts and in the Mississippi Valley, from the Great Plains to the Alleghenies and from the northern lakes to the mouth of the mighty Father of Waters. But all these various uses of our natural resources are so closely connected that they should be coördinated, and should be treated as part of one coherent plan and not in haphazard and piecemeal fashion."

At the close of the Conference, a Committee of Governors presented a series of declarations, which was unanimously adopted. The Declaration of the Governors constitutes an important state paper. It declares for measures looking to the conservation of all natural resources. "These natural resources include the land on which we live and which yields our food; the living waters which fertilize the soil, supply power and form great avenues of commerce; the forests which yield the materials for our homes, prevent erosion of the soil and conserve the navigation and other uses of the streams; and the minerals which form the basis of our industrial life and supply us with heat, light and power.

"We agree that the land should be so used that erosion and soil-wash shall cease; and that there should be reclamation of arid and semi-arid regions by means of irrigation, and of swamp and overflowed regions by means of drainage; that the waters should be so conserved and used as to promote navigation, to enable the arid regions to be reclaimed by irrigation, and to develop power in the interests of the people; that the forests, which regulate our rivers, support our industries and promote the fertility and productiveness of the soil, should be preserved and perpetuated; that the minerals found so abundantly beneath the surface should be so used as to prolong their utility; that the beauty, healthfulness and habitability of our country should be preserved and increased; that sources of national wealth exist for the benefit of the people and that monopoly thereof should not be tolerated.

"We commend the wise forethought of the President in sounding the note of warning as to the waste and exhaustion of the natural resources of the country, and signify our high appreciation of his action in calling this conference to consider the same and to seek remedies therefor through coöperation of the nation and the states.

"We agree that further action is advisable to ascertain the present condition of our natural resources and to promote the conservation of the same; and to that end we recommend the appointment by each state of a commission on the conservation of natural resources, to coöperate with each other and with any similar commission of the Federal Government."

The Conservation Commission.

On the eighth day of June following the Conference, the President appointed a Commission on the Conservation of Natural Resources, to coöperate with any similar commissions that might originate in the states, thereby setting in motion the recommendation in the Declaration of the Governors. The Commission, in the words of the President, "will be organized in four sections to consider the four great classes of water resources, forest resources, resources of the land and mineral resources." The Inland Waterways Commission was directed to form the section of Waters. The President designated chairmen and secretaries for each section, who are to constitute an executive committee, with a chairman who shall also be chairman of the entire Commission.

Many of the states have already appointed commissions to coöperate with each other and with the national Commission. Although the agricultural interests were not represented as such on the program of the Conference or in the naming of the Commission, the movement is nevertheless inclusive of all efforts to save and improve our heritage, of which the agricultural effort is fundamentally the most important. The Commission is now making an inventory of the natural resources of the nation; and it is seeking to coöperate not only with governmental commissions, but also with all organizations that are interested, as with the National Lumber Manufacturers' Association, American Academy of Political and Social Science, National Board of Trade, American Paper and Pulp Association, and others. This illustrates the extent of the connection and suggests the nature of the great influence that it will exert. There needs also to be definite coöperation between the Commission and the agricultural societies.

Commission on Country Life.

On the tenth of August, 1908, President Roosevelt recognized the agricultural interests in the appointment of a committee of five persons to constitute a Commission on Country Life, to report a summary opinion before the close of the year.

"We Americans are making great progress in the development of our agricultural resources," the President writes in naming the Commission. "But it is equally true that the social and economic institutions of the open country are not keeping pace with the development of the nation as a whole. The farmer is, as a rule, better off than his forebears; but his increase in well-being has not kept pace with that of the country as a whole. While the condition of the farmers in some of our best farming regions leaves little to be desired, we are far from having reached so high a level in all parts of the country."

"I doubt if any other nation can bear comparison with our own in the amount of attention given by the Government, both Federal and State, to agricultural matters. But practically the whole of this effort has hitherto been directed toward increasing the production of crops. Our attention has been concentrated almost exclusively on getting better farming. In the beginning this was unquestionably the right thing to do. The farmer must first of all grow good crops in order to support himself and his family. But when this has been secured, the effort for better farming should cease to stand alone, and should be accompanied by the effort for better business and better living on the farm. It is at least as important that the farmer should get the largest possible return in money, comfort, and social advantages from the crops he grows, as that he should get the largest possible return in crops from the land he farms. Agriculture is not the whole of country life. The great rural interests are human interests, and good crops are of little value to the farmer unless they open the door to a good kind of life on the farm."

"It is especially important that whatever will serve to prepare country children for life on the farm, and whatever will brighten home life in the country and make it richer and more attractive for the mothers, wives and daughters of farmers, should be done promptly, thoroughly, and gladly. There is no more important person, measured in influence upon the life of the nation, than the farmer's wife, no more important home than the country home, and it is of national importance to do the best we can for both.

"The farmers have hitherto had less than their full share of public attention along the lines of business and social life. There is too much belief among all our people that the prizes of life lie away from the farm. I am therefore anxious to bring before the people of the United States the question of securing better business and better living on the farm, whether by coöperation between farmers for buying, selling, and borrowing; by promoting social advantages and opportunities in the country; or by any other legitimate means that will help to make country life more gainful, more attractive, and fuller of opportunities, pleasures, and rewards for the men, women and children of the farms."

"My immediate purpose in appointing this Commission is to secure from it such information and advice as will enable me to make recommendations to Congress upon this extremely important matter. I shall be glad if the Commission will report to me upon the present condition of country life, upon what means are now available for supplying the deficiencies which exist, and upon the best methods of organized permanent effort in investigation and actual work along the lines I have indicated. You will doubtless also find it necessary to suggest means for bringing about the redirection or better adaptation of rural schools to the training of children for life on the farm. The National and State Agricultural Departments must ultimately join with the various farmers' and agricultural organizations in the effort to secure greater efficiency and attractiveness in country life."

It is most gratifying, and hopeful of better outlook for the farmer, that the President of the United States recognizes the importance of inquiring into his conditions with a distinct view to bettering them, putting the executive machinery of government behind the work. This movement casts no reflection on the farmer, nor criticizes him: it seeks to remove the disabilities, to put governmental forces at his command, and to allow him all possible opportunity to develop his business and affairs. It ought to be the beginning of a new agricultural epoch.

Every business must constantly adapt itself to the conditions of its place and time. It cannot remain stationary unless it loses in effectiveness; and then it begins to decline. In the continuing readjustment, inequalities are sure to arise, and these inequalities and disharmonies must be studied and corrected. An organization of national scope, permanently at work and having executive authority, could do much to direct the progress of country life, if it were composed of wise and honest men.

Chapter VII.

The present chapter assumes the home as the center of the social development of the open country, as Chapter VI assumes the farm as the center of the economic system. We therefore begin with a discussion of the home in its relation to the community; we then pass to the surroundings of the home in its neighborhood bearings; thence to a general discussion of associative effort; and thereafter to consideration of particular kinds of community work. The theme of the chapter is welfare work. The chapter closes with lists of organizations. Many of these organizations are primarily economic; but it has seemed to be unwise to make any effort to classify the organizations now in existence.

The reader will miss from this chapter any discussion of education; this subject is so large that it has seemed best to separate it in a chapter by itself.

THE FARM HOME A CENTER OF SOCIAL PROGRESS

By *Mrs. Ellen H. Richards*

The goal of social progress is not only the existence ot a group of well-informed, well-dressed, well-mannered people, but also of a community the people of which have kindly feelings toward one another, a disposition to be helpful at all times, and a willingness to work together in order to accomplish some beneficial result. Such a well-bred community must be progressive in ideals, and active in the accomplishment of them. There can be found no better nursery for this ideal of social progress than the home-life on the farm. There is a duty for every member of the household to perform,—a duty that not only helps the individual but ministers to the general welfare. The farm home, in spite of all that may have gone from it in recent years, has the best opportunity to train for citizenship.

The philosophy of life.

On the farm there is always something going on—something of interest. Trees are budding, sap is running, lambs and calves, chickens and colts are coming into the world to be cared for. Grass and grain are ripening and need to be cut; fruit is to be picked, and buildings are to be repaired to protect the animals from the winter's storms. Some of these duties are disagreeable, as for example, the killing of pigs and dressing of poultry, but they are soon over, and the pleasure of seeing the work of one's hands prosper always remains.

Man is creative under stimulus, not merely through his own initiative. It is said by students of modern philosophy that what one makes is more truly enjoyed than what one buys or finds. Why, then, is there so much discontent with farm life, and why so great lack in efficient methods and results? Why are the farmers' wives so often indifferent to social progress?

Perhaps it should not be surprising that the influence of the idealistic philosophy of the early ages and of the fatalism that is unconsciously absorbed from contact with the inevitableness of the seasons of the year should have been so strong with the tiller of the soil. Man is the sport of nature in her wild moods, of the tornado and flood; he is helpless in earthquake and fire. Most forms of religion have fostered the element of submission to the inevitable, and in most countries man seems to have taken cruel advantage of the animals as a sort of compensation for his feelings.

The essence of the philosophical teaching that filtered into the average consciousness was that man's mind was his kingdom, and that as he developed soul and intellect so he rose in the scale of creation. His body and all that pertained to bodily welfare were only hindrances—whatever was done for it was done only under protest. This element of fatalism was very strong in a large part of the pioneer settlers of our country. The improvement of their surroundings stopped short of themselves. They failed to connect cause and effect in their own ill health and habits.

It is, therefore, not unnatural that rural communities, under the spell of past inheritance and nature's power, should be slow to seize upon the advantages that science has given to man. In spite of the great strides in knowledge that have enabled man to cope successfully with many of those adverse forces, and to bring the irresistible powers of nature under his control, so that at last, he no longer fears but confidently hopes, there lingers in most rural communities a medieval fatalism, a sense of helplessness, which is a very real obstacle to social progress. In traveling through a farming country one is so often impressed by the careless appearance of the farmstead — gates off their hinges, implements dropped anywhere. These pathetic signs point to a tendency to accept existing conditions without a struggle because, in the experience of the individual, struggles have been useless.

The courage of science.

We have learned to search for causes in the case of various indolent groups of people. The search has been rewarded in several instances by the discovery of a very real disease sapping the vitality of the persons suffering from it.

It is generally accepted that the indolence of many communities is largely due to the hook-worm disease and, in a recent book (Malaria: A Neglected Factor in the History of Greece and Rome, Macmillan, 1907), Major Ross has suggested that widespread disease, particularly malaria, may have had far-reaching effect in the physical degeneration and mental decay of those once powerful peoples.

There is no doubt that the same cause has tended to foster that shiftlessness and depression found in many malarial country districts. Habits of living have spread the great white plague, tuberculosis, so that the farm home, instead of being the nursery of the best citizens, sometimes becomes a hot-bed of disease. This is clearly man's fault and is due to his ignorance. Today, if he is ignorant it is because he shuts his eyes. No home is so isolated that it may not, if it will, learn the preventive measures to be taken.

The new message that science has brought to man—foreshadowed by, "If ye would rule, be ye servant"—is, that if a man is to conquer, to subdue nature's forces as he has the animal kingdom, he must become the student and servant. He cannot conquer by rebellion, nor by patient submission. It is only by understanding that he can rule. In mechanics, this has been done in the past century to a marvelous degree.

In the last fifty years, electricity—no less dangerous than before—has been harnessed to work at man's behest. In the last ten years, man has shown that his conquest of the air is certain. Science knows not the word "fail;" it is always hopeful under repeated defeats; it does not give up to the despair of fatalism. Only after having conquered so much of nature has man turned his awakened interest to himself, to the fundamental improvement of his own race. Man has ever been most backward in applying knowledge to his own well-being. He has accepted sickness and death long after he might have prevented them. He has only begun to accept the word of science, that "It is in the power of man to make all parasitic diseases disappear from the earth," and has resolved to familiarize himself with the methods prescribed.

It is belief in the reality and practicability of this power in man to conquer his own environment that, in the next fifty years, is to work wonders in all farming communities that accept the help science gives. As expressed by Edwin Chadwick, the father of modern sanitation, we must get behind Fate to the causes which bring about the dreaded results.

In cities, with so many evidences of accomplished effort, the intelligent classes accept the doctrine of man's responsibility for man's ills, bodily and socially. The rural community is still fatalistic and has not learned to get behind Fate. It patiently accepts long hours, heavy work, dull routine and indigestible food.

Necessity of coöperation.

For the carrying out of effective improvements, the coöperation of all of the population is needed. One-half of the marsh to be drained, or the pool to be kerosened, may lie in an adjacent village, or may be town land near the schoolhouse or the church. Cordial coöperation is, therefore, the fundamental requisite in effective improvement.

The days of isolation have passed. The telephone, the trolley car, the rural delivery, have brought the scattered farm homes into a community. Knowledge of the better ways of work and of living is at hand and to be had for the seeking. With this knowledge, labor on the land and in the house may be so efficient as to leave hours for self improvement and for social pleasures. The golden opportunity is at hand to develop a twentieth century life of the best type.

The retarding effect of discouragement under difficulties need be felt no longer. Help is available; the various magazines, lecturers and writers are already dispensing it. Local and individual conditions make much of the written word inappropriate, but the stimulus derived from the effort to explain its inappropriateness will, in the awakened mind, suggest substitutes.

Means of home betterment.—What are the steps to be taken toward bringing this golden age into reality?

(1) The appreciation by the fathers and mothers of the greater good to be reached by a little effort, by a little self denial, by a certain humbleness of spirit that will make them willing to learn even of the younger generation who have been taught different methods. Knowledge is increasing at such a rate that changed views come about oftener than once in a lifetime. It behooves the elders, therefore, to keep their minds as well as their bodies plastic and supple, so that they may adapt themselves to innovations and not resist them.

(2) The education of the children while in school, to become observers of nature, to be in sympathy with her moods, and, as they grow older, to supplement her natural forces with acquired knowledge. It is just at this point that effort should be directed to give the children in the farm home sufficient material to stimulate them to learn of the life and processes going on all about them. This effort should be not to give them ready-made knowledge, but an incentive to find out for themselves what lies at their hand.

It is a simple matter to take kodak pictures of trees, vegetables or animals at given dates and thus start a record of growth or of early or late seasons which will afford great satisfaction and will be of benefit in determining whether the season is an early or a late one. This record also helps in planting and in the planning of work. A difference of as much as twenty-nine days has been found in the neighborhood of Boston.

Various industries may be carried on in the homestead. There may be, for instance, a carpenter's shop in which simple furniture can be made and carved to satisfy the sense of beauty and the desire for work done by one's own hands.

The objection so often made that life on the farm is not interesting does not hold today when books, magazines, study clubs and correspondence schools abound. Neither does the objection that the work is so hard that there is no time for this study and for recreation hold, since there are manifold aids to work and numerous ways of making it lighter.

It is a spirit of coöperation with natural laws, and not of rebellion that leads to despair, that will replace that grim determination to conquer which leads to hardness of heart if not to utter defeat.

(3) The technical education of the youth in the best methods known and, better still, the training that gives them power to find better ways for themselves. This training must be of the right quality even if it is limited in quantity. There are many advantages in the winter sessions of three or four weeks' or months' duration. During these the young people may acquire inspiration for the summer work and find courage in the ever-present thought that they may carry their difficulties to their teachers the next winter. The thread of learning is thus woven into the fabric of doing in so firm a manner that it will hold all through life.

While the farm life is, in a sense, patriarchal, it must have a community and not a tyrannical spirit. This spirit is much more readily developed in these days of free communication, when it is known what others are doing, and when the farm is no longer dependent upon the habits of its previous owners.

To try new things is the birthright of youth; if this is denied, it leaves the penned-up life and seeks new fields. The exodus from the farm of its young people has largely been because of the irksomeness of the inflexible routine, the deadly grind and the repression of thought. It was this tenacious adherence to tradition that drove the young people from the eastern farms. It is a generous recognition of the possible improvement of farm life, of its development into a great educational factor in the community, that will attract more and more to agricultural life with its possibilities for the richest and most wholesome living, — what Benjamin Franklin called "pliability in the hands of new circumstances."

The agricultural school and the agricultural press have done much to counteract tradition. Visits to model farms, social gatherings, and farmers' institutes have made new methods familiar. Now, the young people may have an experimental plot, may refurnish the parlor, may cook new dishes, and gain a smile and not a frown from their elders; this, in itself, is a great advance. No one can grow, hooped in with bands like a barrel. To keep young people on the farm, they must be given a degree of both freedom and responsibility.

Even the frontier farm feels the throb of the twentieth-century engine, and its life, thought and habit must be adapted to the changed conditions.

(4) There should be a model establishment to be studied, criticised, and to serve as a basis for the designs of others better suited to local conditions. That which enters the mind through the eye penetrates deeper than that which enters through the ear. Light has greater velocity and intensity than sound. Not only a model barn should be built, but also a model farmhouse in which all the labor-saving appliances may be found; in which the construction permits the best sanitary conditions. This house should be simply furnished in good taste, and surrounded with trees and shrubbery in an attractive planting.

What is needed to make the farm home a great force in the uplifting of community life is coöperation. Conferences should be held as to the best ways of saving labor, of keeping clean, and the like. Two-thirds of the hard work in the farm-house, as we knew it as girls, was as unnecessary as is the keeping of a maid to pick up the toys and clothes that the children should have put away for themselves. No farm hand need wear such soiled shirts as we saw; a little care and personal cleanliness would save much of the cost of his "keep."

(5) Of vital importance, practical sanitation and personal hygiene should be taught from babyhood throughout life. Man ought to make the most of himself and not allow his body as well as his mind to become crippled. The right combinations of food, suitable preparation of it, good water, complete drainage, fresh air and sunlight are to be had for the asking on the farm. In the city they are becoming costly.

With right living, in a physical sense, go hand in hand good spirits, courage, energy, pleasure in work. All this is more easily attained on the farm than elsewhere. It only needs the will to learn and to apply what has been discovered in the scientific laboratories of the world, aided by coöperation and free communication with others like-minded.

This means work, incessant work, and the question arises, Where does recreation come in? Change of occupation is recreation. Not so much amusement in seeing entertaining things is needed as delight in one's own activities. Let the neighboring farmers come together not only to hear a lecture or to see pictures or to talk, but also to work together for some pleasant end. An unfortunate neighbor has had his house burned, has a sick wife, or needs a new barn. The occasions of help may be times of great social enjoyment. The building and the furnishing of the cross-roads schoolhouse may, for example, be made the occasion of pleasure and fun.

Work is a part of the daily living; it is not an outside garment to be put on and taken off. It should therefore, be permeated with the spirit of joy, of eager anticipation of betterment. Social gatherings should be helpful in practical ways. The county fair has always had this end in view. Let there be social meetings more frequently, with exhibits of bread made by the daughters and of chairs or tables made by the sons. Let there also be intensive discussion and illustration of methods and of completed results.

The farmer, as well as his wife, must contribute to the success of the household life. The old idea—"You attend to the house, I will look after the outside," is responsible for much of the backwardness of the farm home. The ideas gained in the use of machinery, of stock-feeding, of the effect of light and air, of clean water and careful grooming, should be available for improvements in the house.

The woman's sense of neatness and order should help to keep the outbuildings and grounds in order.

The combination of groups of women in the study of some of these methods has often been urged. This study may be by correspondence courses, after the fashion of the famous Boston Society, of which Miss Anna Ticknor was the leading spirit from 1873 to 1898.

The Society to Encourage Studies at Home, familiarly known as S. H., brought to the isolated farmhouse just the guidance, criticism, and sympathy needed. Questions about dress, house furnishings, house building, different personal relations, the best books and the manner of using them in order to gain something worth while—all such subjects were discussed once a month by the friendly correspondent for her distant questioners. In science, geology, mineralogy, botany, in history, and in art, books were sent, and travel courses made out, carrying the family to other lands. In most cases, the family participated in the use of the books.

In the human sympathy and in the adaptation of the suggestions to the circumstances, such personal correspondence far outranks the query columns of the magazines. It means time and thought for both, but the value gained far outranks any mere wholesale endeavors.

The traveling library is one of the best agencies, and might be extended. These lists are now sent out from several state libraries, and boxes of books and notes and illustrations are widely circulated.

The following quotations are from a letter from one of the students of the Society to Encourage Studies at Home: "I do not know where I should stop if I tried to tell how much they have helped me in my isolated life. I have craved so much and there seemed no access possible to anything I wanted. With no advantages here, I had drifted into an aimless way of living . . . I have lived always with an inside longing for something different; life was a burden to be carried cheerfully, yet I never quite conquered the feeling that the burden was heavy. S. H. has taken away that feeling, and, before I was aware, the load was gone. I have written thus of myself, not because my individual experience is of importance enough to interest any one, but because I believe the world is full of people with the same wants that I have, and it may be some satisfaction to know how fully you are supplying them."

Compensations.

The sense of ownership in the common home is strong, because each one has a part in maintaining it. The youngest child who brings in chips to start the fire or picks up wind-fall apples, the schoolboy, who feeds the chickens before starting for the schoolhouse, comes back to his home as his own, even if he is now and then rebellious at the time these little duties take. It is this kind of work that makes for the common good while benefiting one's self, that differentiates work on the farm from work in a city house, from selfish housekeeping in a flat.

It is this mutual effort toward a common end that is the basis of good citizenship and the foundation of all social progress. Every member of the family contributes something of suggestion every time a new project is broached. The new corn barn, the addition to the kitchen, the laying out of the vegetable-garden, thus often serve as bonds of such friendly argument and discussion as are broadly educative.

Another lesson learned early in life is the pleasure of anticipation through self-denial. Planting and harvesting are dominating factors; picnics and social parties must wait. No one who can go to an entertainment any evening he likes has the faintest idea of the multiplied pleasures obtained from anticipating it for three months. There is also this compensation, that while the fact in both cases often proves dead-sea fruit, nothing can take away the pleasure of anticipation.

The farmer's wife is learning that rag carpets and home-made curtains may be beautiful and appropriate as well as serviceable. The development of farmhouse customs in dress and furnishings must follow along the lines of true beauty, namely, adaptability. To copy the fashions seen in city streets is not to elevate the farmhouse; to buy the flimsy furniture seen in the department store is not to furnish with good taste. The old colonial houses furnish the best examples of plain, serviceable chairs, tables, and the like, with good lines and colors. The old wainscoting was far better than modern flowered, dust- and arsenic-carrying papers.

Freedom of action, opportunity for individuality, are catch-words we often hear. In the house on the farm there is greater freedom and greater opportunity than anywhere else except in the case of a wild nomadic life without the advantages of civilization. The farm-wife is supreme in her realm—no class of men interfere so little, as a rule, with the work of the house or are so little affected in their own work by the wishes of the women as are the farmers. The farm-wife has her own recipes, her own way of making a bed, of placing her furniture, of making her soap or butter, or preserving. She hangs the pictures she likes best and dresses her hair as she pleases. She takes whatever magazine she likes and believes as little of what she reads as any one. This often makes her too opinionated and "set in her ways." At bottom, however, she is not unwilling to copy if it can be done unostentatiously. The great mistake in the farmhouse is that "mother's ways" are regarded as the best possible. The mother may have lived in the last century and before machinery ruled the world.

Ideals.

A wholesome independent and yet social life, and individuality within reasonable community limits are ideals to be striven for. The greatest need in farm life from a social point of view is the use of time in necessary work so as to permit of hours for mental recreation.

A knowledge of the right position of the body to utilize the mechanical action of the muscles to the best advantage enables work to be done without undue fatigue. In the work of the house particularly, is this true. From the house must emanate those influences that are to effect social progress in the community. When one sees the bent form, the tired carriage, the warped fingers and the wrinkled features of so many farmer's wives, one does not at first see anything but cruelty to animals in urging recreation, reading, gardening, social effort, upon such over-burdened women. But a closer examination of conditions will generally reveal a lack of adjustment, of planning work or of utilizing aids. Very often there is an unnecessary burden of tradition weighing upon the housewife, so that she fails to distinguish between the essential and the unessential in her life. Clean hands, tidy hair, well-fitting dress are better worth spending time upon than frosting on cake or lace on underwear.

The breaking up of old traditions and the establishment of new habits is one of the most difficult social accomplishments. It can hardly be done by reading. The influence must come by the eye, and to this end the traveling exhibit will be most effective, showing exactly how the work may be done. This is the preliminary step to the school, for the mothers must be aroused to a sympathetic attitude before they will help in the installation of new ways.

Some gain in these directions is essential before the things that will lift the social status of the farm population will be recognized. The man, too tired and worn to change his barn clothes before sitting at table, must not complain if he is not welcomed by his more sensitive neighbor.

One habit greatly needed in farm life, and greatly missed by those who come from centers where time is money, is that of systematic promptness. Nothing has so held the farmer's family back in the general progressive movement as the habit of being late, failing to keep promises and ignoring engagements. This is not dishonesty, but a lack of a sense of the value of time. These traits naturally enough come from extreme isolation, from a lack of stimulus; and say what the theorists may, we all respond to outward stimulants. If the housewife has no neighborly caller from one week's end to the other, she allows a little heaviness due to last night's overeating or yesterday's unaccustomed cleaning to prevent the prompt dish-washing and cleaning up which means self-respect.

The farmer often drops his broken plow in the furrow and leaves the worn-out cart for the weeds to cover. The general untidiness of an isolated farm is melancholy. The same indifference and ignorance of how other people do work, leads the man to walk through the muck heap and track the floor.

In no other occupation is there so much mind-free time in which to grow by assimilation of all that one has learned. To be able to think while about one's familiar work is a great privilege. It does not require mental concentration to tidy up the house or to put away dishes, once the habit is formed at the age of eight; at least it is as automatically performed as washing one's face.

Certainly there are many processes that will be the better for thinking about while doing them, and the habit once formed will come easy.

In the command of one's time, in the opportunity for growth by contact with people, in the possible time for profitable reading, in the reward of coöperation, the rural community has the greatest chance for social progress that any group of people in America can seize.

THE RURAL LANDSCAPE

By *J. Horace McFarland*

The word "landscape" implies natural or rural, rather than urban surroundings. Of that single view of natural conditions which makes up what dictionaries define as a landscape, poets have sung, and its beauty has inspired the greatest effort of painters. In the rural landscape there is charm, color, form, atmosphere; there is rest for weary brain and tired eye. It is not true that the agricultural worker, living and working in the very heart of the landscape, does not feel its influence; though it is often true that that influence is neither recognized nor confessed by those in whose lives it has been a vital factor. But, since the confession of a love for beauty in nature has too often been accepted as equivalent to a confession of unpractical tendencies or of unbusinesslike ideals, there need be little wonder at the lack of open recognition of the essential value of the natural rural landscape. In this day there is, however, a dawning recognition of the essential and vital relation of unspoiled natural scenery to true prosperity and to good citizenship. It is known definitely that the scenery of the ore dump, the culm bank and the timber slash exercise malign influence upon humanity, and that the working efficiency of that individual is increased whose eyes are rested and mind refreshed by opportunity to enjoy the unspoiled natural landscape. The discussion, therefore, of its essential parts, and of means for retaining, maintaining and increasing its attractiveness, is a discussion falling in the realm of economics fully as much as in the realm of esthetics.

The rural landscape may be taken to include (*a*) the highway, (*b*) the woodlot or home forest, (*c*) the water-course, and (*d*) the farm. Closely related to the adoption of a high ideal of efficiency and beauty for these items of the landscape is the problem of organizations for promoting improvement in rural conditions.

The rural highway.

Elsewhere in this Cyclopedia (page 319) the highway is treated from the standpoint of its economic value as a means of intercommunication. As an essential part in the formation of the landscape of civilization, and more especially as essential to give access to the landscape, it may be here briefly mentioned.

The rural highway may be, and too frequently is, a mere gash in the scenery, serving by its ill-considered location to injure the landscape, while affording no compensating convenience for communication. Who can not call to mind the country road, mounting preferably the steepest hill in a manner alike painful to the eye and to the beast of burden? The reasons for such location sometimes include that absurd reverence for straight lines, which has caused so often the sacrifice of a fine and unreplaceable tree, in order that an altogether ugly and often unnecessary fence may not depart from absolute rectilinearity.

This familiar ugly road, running monotonously straight, without any regard for easy grades or natural contours, and freed as far as possible from that mitigation of its dreariness which trees will bring about, is made yet more of a blot on the landscape by the regulation process of exterminating from its borders all the attractive native plants, while thoughtlessly fostering the survival and spread of ugly and pestiferous weeds. Upon the excuse of "brushing" the all-too-narrow roadway, so that it will "dry out" more readily, and show less of the sins of the road-maker, the delightful carpet of loveliness which nature tends to supply is destroyed, and the more hardy thistles, briars, docks and the like are actually aided to extend their growth.

The highway beautiful, as an essential part of the rural landscape, is all that the common country road of America is not. Located so that its grades are easy and its lines related to the natural contour of the country, it is not only well built but well drained. It is tree-lined, in part at least, and preferably, when the trees are planted, a full proportion of fruit- and nut-bearing kinds are included. Particularly are sweet cherries, the taller-growing apples, chestnuts and walnuts, suitable for roadside adornment and roadside profit. The traffic space of the highway beautiful is in proportion to the business of the locality, and is preferably not wider than will allow comfortable passing, while a turf-covered or wild-grown border intervenes between the well-opened gutter and the bordering tree rows. This useful and pleasing highway has frequent and legible directing signs.

Such a rural highway is made easier to maintain by the very items that make it an essential part of the rural landscape. A traffic space of twelve to fifteen feet, grass bordered and sparingly tree shaded, is kept in order far more easily than a much wider space, nearly always alternating between mud and dust, and attractive in part incidentally rather than primarily. The plea is here made that the highway beautiful, as a part of the rural landscape, is pleasant to use, easier to maintain, and that it adds definitely to the comfort of the people as well as to the value of the countryside.

The woodlot.

This, the "home forest," is also treated elsewhere in this work from its purely economic side. As a feature in the rural landscape, it adds color, variety and beauty, and if disposed upon a hillside it will frequently serve to mitigate or prevent flood damage. As a windbreak, to protect the farm buildings or the highway, the woodlot is also efficient. At all seasons it is not only useful in the rural economy but most pleasing in the landscape.

Water-courses.

A natural water-course adds to the rural landscape a charm and a value of its own. Not often is there opportunity to change a water-course, but quite often there is opportunity to adapt the highway or the farm to the streams so that convenience, utility and beauty are alike fostered. Often, too, there will come the chance to make more attractive, as well as more permanent, the banks of a water-course, and in so doing add to the value of the landscape. A bare ditch is never pleasing and seldom permanent in a land of sudden rainfall; but the same volume of water flowing through plant-held and tree-decked banks is always a delight, and seldom an expense. The main point in improving the landscape through its water-courses relates, therefore, to the care and planting of the banks. In every case, the plants and trees native to the locality should be first and most importantly retained or considered for this work.

The farm beautiful.

The farm is, in the civilized communities of America, a vital factor in the rural landscape. It is the reason, indeed, for retaining the landscape, and it may be, and mostly is, made up of all the items above discussed—the highway, the woodlot and the water-course, adding to these the meadow, the cultivated field and orchard.

It may be assumed that the farm in general has not usually been considered in terms either of beauty or of ugliness. Attractiveness or repulsiveness, in respect of appearance, has been incidental rather than intentional, for the most part, though it is almost axiomatic that the prosperous farm is the most pleasant to look upon, either for its definite sightliness or orderliness, or both.

Working with that natural resource which intelligent use does not deplete nor exhaust, and producing always, if successful, verdure in varying degree and in many forms, the farmer has the most reason and the best opportunity to retain and even to increase natural beauty. He operates in natural scenery without destroying its attractiveness through the supposed necessity under which the lumberman, the coal operator and the miner create unnatural ugliness. His is the occupation that enhances the natural beauty of scenery by the introduction of the peaceful, though inspiring, landscape of growing crops. The waving wheat, the rustling corn, the blossoming of the cotton and its fruitage of snowy bolls; the blooming of the clovers and the grasses; the crops of the orchard and the market-garden — all these may increase that beauty which has so important, even if yet unrecognized, an influence upon human life.

But though the farm beautiful is easy as well as agreeable to have, farming may, and often does, introduce ugliness into the landscape. The beauty of natural scenery may be changed by the farmer into irritating plainness or positive ugliness. He may, by disregarding natural contours, so space his fields and place his highways as not only to make his progress about the farm less easy, but at the same time to mar the scenery. His wasteful fences may continue the impression of untidiness, beginning at his unattractive farmhouse, and increasing as the filthy barnyard and ramshackle buildings come into view. The olfactory offense of his pig-pen may be hardly less than the hurt to the eye of his weedy kitchen-garden and decrepit orchard. Farm tools left in fields suggest the slipshod habit of mind that sees profit in permitting the erection of hideous advertising signs along the highway or facing a passing railway line; and such a farmer is almost certain to advertise his own unthrift and his contempt for pleasant living by turning over the painting of his barn or wagon-shed to the yellow-and-black advocates of some pill or nostrum. His lanes will be treeless and his dooryard flowerless, and frequently his pocket almost moneyless. The farm ugly is seldom the farm prosperous and never the farm pleasant, while from it flee the young men and young women who ought to stay, driven out by the unrecognized lack of home attraction no less than the fully recognized lack of opportunity for advance.

Those great civilizers, the rural free delivery of mail and the telephone, are changing the order of things in respect to farm appearance hardly less than in respect to farm prosperity. The farmer—or the farmer's wife or daughter—reads and sees; and in consequence wants all the pleasant things of life that may be practicable about the farm. There may readily be created pleasant farm surroundings, and the farm beautiful is a good place for a home beautiful and attractive, altogether aside from the expensiveness of its housing. Increasingly one finds the farm beautiful, about which gathers the pleasure of rural living, as well as its profit. Such farms ornament and improve the landscape.

Principles for beautifying the farm.—The principles on which the farm beautiful may be made are simple and few. The first principle may well be that of retaining and increasing the natural beauty of the scenery about the farm. The placing of the fields so that, having always in mind proper use of the soil for its utmost productiveness and its increase in fertility, there shall be an agreeable simulation of nature's variation of meadow and wood, will not at all decrease landscape attractiveness. To avoid unnecessary fences; as before suggested, so to lay out lanes and highways as to secure easy grades even at a sacrifice of the straight line which is not always the shortest distance between two points; to plant trees—especially fruit and nut trees—along these highways and byways; to keep in mind the ever-increasing value of timber, so that the wood-lot, sanely used, is always a reminder of the great forest—all these and other practices of farm profit will tend toward the retention and increase of natural scenic beauty.

A second principle may well relate to the convenient, agreeable and harmonious design and placing of the farm buildings. These are frequently an index to the farm condition. They ought to be sightly as well as practicable, and comfortable as well as convenient. Simplicity should always rule—but often we see the elaborate and expensive scroll-saw adornment of porch or cornice dropping into shabbiness, when the original cost of these ornate adjuncts would have supplied much-needed kitchen conveniences for the wife. Simplicity and ugliness are not synonymous, any more than are expensiveness and elegance.

The farm buildings should be both simple and sightly. Often a little attention given to a reasonable harmony of their architectural forms, together with as much thought exercised as to their location, will give a most pleasing result. Consider, for a moment, the way in which George Washington, who was first of his time in more than war, peace and statesmanship, placed the various structures comprising his farm outfit at Mount Vernon. The result could not have been so pleasing or so convenient if the location and the design had alike been of the random nature so often seen.

It is not the purpose of this sketch to make arbitrary suggestions or to present plans for the placing of the farm structures. It is the purpose here to propose what has come in city design to be known as "the grouping plan." Where there is a proper grouping plan, each structure, so far as style and location is concerned, are considered with relation to every other structure, erected or to be erected. A plan may involve the home, several barns, separate wagon-houses and other structures, of which at first but one or two may be erected. As others are added, they fit into the general plan, and add to its completeness. If no building is newly placed until there is considered and adopted a general plan involving the tentative placing of all the buildings likely to be required for handling the products of the entire farm, mistakes will be avoided, convenience fostered, economy subserved and good appearance surely promoted.

Another principle needing to be considered in making the farm beautiful is the planting of trees, shrubs, vines and bushes, economical as well as ornamental. A certain most successful farmer looks out from the bathroom (and he likes that second-story bathroom, which is an evidence of his prosperity as well as a contributor to his health and self-respect) of his farmhouse over a charming formal garden, leading away toward his fertile fields. There is a thin fringe of flowers next the house; but the kitchen-garden, the currants, the blackberries and other small fruits, some low-growing Japanese plums which make up the picture, framed in by the sturdy home apple orchard on one side, and by a well-placed barn on the other, are just as profitable and successful as if planted upon the ugly and ill-considered lines so familiar to all of us.

But there may well be some purely ornamental planting about the farm that is to be successful in all respects. Such planting needs to be considered with especial care. There comes to mind a farmyard made grotesque by the presence of a dozen specimens of the Kilmarnock variety of weeping willow, a tree of which an occasional specimen may be harmlessly introduced into an extensive group of shrubbery on a large lawn. In the case in mind, the willows dominate and make absurd the approach to the farmhouse. There is no reason why the home grounds of the farm should not be planted in good taste, and with a succession of hardy shrubs and vines that will give pleasure the year round, either in bloom, foliage, bark-color or twig-tracery. Many of the agricultural schools now teach landscape gardening, and information may be readily had as to what to plant.

The farm ornamental planting may be made, paradoxical as the statement appears, pleasantly peculiar and individual by using most freely the wild shrubs of the immediate neighborhood, often obtainable without purchase cost. The tiresome monotony of "Golden Glow" and *Hydrangea paniculata grandiflora* can be avoided by looking for the best things that belong on the land. Many a farmer buys a stiff privet hedge who has the lovely wild-rose ready at hand to give him better service. The native laurel and rhododendron are overlooked by the farmer who buys foreign weaklings from the nursery, while the same nurseryman may be collecting nearby and selling carloads of these splendid American evergreens to wise millionaires. A great boneset, six feet tall and crowned with a mass of gray-white blooms, distinguished one place; a finer show than the native wild asters will make, with encouragement, can hardly be conceived.

The farm planting, therefore, may fittingly and beautifully preserve and improve the rural landscape by using and encouraging the native plants of the vicinity.

Fences must not dominate the farm beautiful. Where divisions are necessary, let them be of neat and inconspicuous wire construction. Certain border fences and main divisions may be of suitable hedge plants—permanent, sightly and satisfactory. The openings or gateways may, on the farm beautiful, very well be distinguished by a tree or a climber upon a post, especially if such a mark is part of a vista to be seen across the field or down the lane.

Perhaps a final principle underlying the farm beautiful is that relating to the isolated trees that are the pride of some farmers and the annoyance of others. A great elm or a splendid chestnut in the center of a field is a delight to the eye and its shade most grateful on a hot day; but it takes both fertility and moisture from a considerable area. It may well be retained on the basis that the pleasure and rest the tree affords are really worth more than would be the product of the soil it uses. If this view is taken, it is far better to turf the space about the tree, instead of endeavoring to invade its soil area by cropping under its spreading limbs. Let these oases be frankly given up to the trees and to the purposes of rest they indicate.

As previously suggested, a water-course through a farm property may be made a thing of joy with but little expense or trouble. And the drainage into this stream should be taken into account. A series of grass gutters have withstood heavy flood conditions for years of increasing efficiency; and, with their proper placing, the surplus storm waters are prevented from carrying away precious soil.

The farm beautiful, once accomplished, has a pleasing effect on all who come into relation or contact with it. It is almost sure to be the abode of intelligence, and the advance in material prosperity, of which it is an evidence, is no greater than the advance in mental outlook that it fosters. The farm family is the first beneficiary; but the "help" about the place are participants, and the countryside gains also. No farmer whose home grounds are sightly and orderly ever felt less responsible among his neighbors in consequence, and even those misguided economists who affect to despise appearance and to shun beauty will often covertly, and to their own benefit, imitate what has been done.

Obviously, the slipshod, befenced, sign-marked, run-down farm, with random and ramshackle buildings, rutted lanes and treeless roads, is at a serious disadvantage commercially; and even the well-tilled farm about which the surroundings are repellant is not so salable as if pleasant conditions are apparent to the inquirer. Undoubtedly the farm beautiful is best to have and to live on, and decidedly best to sell when that necessity comes.

An attractive rural landscape tends toward stimulating high civic ideals, for it constantly, even if insensibly, suggests improvement. The individual farm beautiful is soon imitated, and good roads are likely to follow. Then comes attention to school buildings, and a general growth of local pride which sets the rural community higher in the scale. It is the inhabitants of the beautiful country-side who are most likely to become the best citizens. Instances are known where men, at first uninterested, have become exceedingly valuable to a community because of an effort to supply some general need for improvement, leading to comprehensive attention, not only to appearance, but to efficiency about the individual home and farm units which make up the rural landscape. All local ideals are thus advanced.

Rural improvement organizations.

Organization will help in making and maintaining the rural lanscape beautiful in all its parts. The farmer can do much with his own property, but, alone, he is almost helpless in regard to the highways. Moreover, Americans in general work best under organization, and proper organization promotes efficiency and economy.

The American Civic Association has had much to do with rural improvement, and its officers have thus come to know of the value of organized effort. To deal with those forms of special privilege, such as the sign nuisance, the automobile disregardful, the browbeating tactics of some of the telephone and trolley corporations, which are likely unfairly to pervade the rural landscape, organization is invaluable. Such an organization of a half-dozen or more dwellers in the country can, by affiliation with the national organization, get in touch with general progress upon lines of interest, and thus avail itself of the latest information upon the point in question at any time.

As showing in a concrete instance the value of organization, there is printed here an account of what was accomplished in a rural community of Michigan as reported by Charles H. Barnes, of Kalamazoo:

"Comstock has a population of 200. Though well situated on the main line of the Michigan Central Railroad and on the line of an interurban electric road, the town had failed to take advantage of its opportunities.

"The town is famed for the beautiful and picturesque scenery that extends in every direction and along the Kalamazoo river that winds near.

"As the population changed, and more people from the near-by city, who had been accustomed to city advantages, became interested, it was seen that some sort of an organization was necessary. The greatest needs were for walks, lights, a better school system, a public hall, better roads, and a new bridge. There was also need for some organization that would bring the people together closer socially and secure their coöperation in cleaning up and beautifying their homes. The need was also apparent of an organization to treat with the Interurban Company as to a waiting-room and ticket office and on account of other grievances that might come up. It was plainly seen that, just so long as we were without organization, we were helpless; but when a committee representing some organization requested a hearing or had a grievance, different results might be expected.

"The Comstock Civic Improvement League was formed. The campaign began with a banquet, followed by some good speaking along the line of our proposed work and the need of such an organization. Papers were circulated for members of the League at twenty-five cents per year, after which officers were elected and committees appointed to take up the several lines of work laid out.

"This banquet was held in a large private house, there being no other place to hold it at this time, and was a success beyond all expectation. Arrangements were soon made whereby an abandoned church was remodeled into a hall. After two years, this becoming inadequate, a large addition, containing a kitchen, dining-room and stage, was built.

"A discussion of the school question brought out the fact that the people wanted the best there was, and after some two years resulted in a centralized school, which is the pride of the residents in this and the neighboring community. Several school districts were merged, and at a cost of several thousand dollars a new school was built, the proper equipment was installed, and sufficient teachers were employed. All grades are taught, including a kindergarten and full high-school course. A complete chemical laboratory has been added, and manual training is being taken up. The school at the present time has enrolled 211 scholars, which, considering the size of the town, is remarkable. A large part of these scholars are brought to the school and returned to their homes every day, some as far as four or five miles distant. Three large covered carryalls are used for this purpose, while many are carried by the electric cars at special rates, the expense for both being borne by the school district.

"It would appear at first thought that such a system would be somewhat expensive to maintain, but when it is considered that several small schools with their very inefficient methods and proportionately high expense per scholar were closed, and all money from these districts was transferred to this one school, it will be seen that much more could be accomplished with the same expenditure. All that the attendants of the large city schools receive can be obtained here, including special teachers and the enthusiasm of large numbers of scholars, in contrast with small isolated country schools employing one teacher. Then there is the athletic side, the lyceum, the high school orchestra and other musical organizations with their training, besides the social side of such a school as this.

"Many other improvements have been made in the past two years, all the results of the League, among them being the following: The installation of an electric warning bell at what was considered a dangerous crossing, together with other safety devices; electric lights and kerosene street lamps were installed and maintained by the League; a large amount of cement walk has been laid and more will be put down the coming year; a new concrete and iron bridge has been built, which was badly needed, but would not have been secured except through the organization, as much opposition was encountered in other parts of the township. Roads have been improved and much more work is planned ahead. A comfortable waiting-room and ticket office has been established for interurban patrons. A reduction of the fare to a five-cent rate was obtained by buying commutation tickets. The schedule of the electric cars has been changed at various times to accommodate the local patrons.

"Besides the above, it is noticed that the general appearance of the town is improved; houses are better painted and yards kept up, more trees and shrubbery planted, and in other ways the fact is demonstrated that the desire for the improvement of their surroundings has been aroused. As a result of this campaign for a better town and better surroundings, values have increased and much property has changed hands. Additions have been platted out into village lots, cement walks laid, and shade trees set. One important change can be seen in the social life of the community. While formerly comparatively few young people were in evidence, there being no social or school life worth mentioning, it is now a noticeable fact that not only are the young people of the town kept in school and at home, but new residents with their families, many from the city, are building homes. With suitable transportation facilities and exceptional school advantages, the only barriers to country life, especially with a family of children, are removed."

Plate XIV. A worthy farm-house. A Canadian farm scene

FARMERS' SOCIAL ORGANIZATIONS

By *Kenyon L. Butterfield*

The chief spurs to coöperative effort in modern times have arisen out of the division of labor, the factory system, the industrial dependence of the laborer, hot competition—in the economic field; and in the social realm—the desire for self-improvement, the altruistic spirit, the passion for public righteousness. The American farmer has been, and is yet for that matter, a rampant individualist. Land ownership has given him the feeling if not always the fact of economic independence; the isolation arising from the plan of relatively large farms, each with its own farmstead, has given him social independence. For decades he felt none of the economic pressure that incited the laborer to organize, or the competition that led to combination of capital. He did not have the social incentives that the city gives, for self-culture or for public service. Nevertheless, the same forces that have made our day distinctively one of organization have operated gradually among the farming class. This class for reasons easily explained has never organized with the same unity as the laboring class. But the movement has been significant and the results of vast consequence.

Forms of organization.

Farmers may and do coöperate for a variety of reasons. These reasons outline the different forms of farmers' associations somewhat as follows:

(*a*) Those primarily for sociable or friendly ends, such as a picnic association for holding an annual outing.

(*b*) Those primarily for educational ends. These are of two kinds: (1) Those intended to disseminate technical information, such as the original cattle-show or agricultural fair, and the modern horticultural or stock-breeders' association, and (2) those designed for the discussion of questions of more general interest to their members either as farmers or as citizens, as the early farmers' clubs.

(*c*) Those primarily for political ends, which attempt to carry the class vote as a unit for a particular candidate, measure, or party, or endeavor to secure legislation supposed to be of special value to the class, or try to give expression to the class opinion on questions of general public concern.

(*d*) Those primarily for commercial or business ends, which usually seek some form of coöperative selling or buying.

Obviously these diverse purposes may overlap in any given association of farmers. From the beginning the agricultural fair had its sociable aspects which survived long after the strictly educational value of the exhibition had faded. Every effort at coöperative selling has involved a necessary educational preparation and result. Every endeavor to secure legislation has likewise incited discussion, given new knowledge, brought real education. Every gathering of farmers, for any purpose whatever, almost inevitably takes on the aspect of a friendly visit.

Definition of farmers' organizations.

The attempts of farmers to coöperate for any of these ends or all together logically fall into two classes with respect to extent,—those that are essentially local and those that are national, nominally at least; and also into two classes with respect to effort,—those that serve some special end or special industry, and those that seek to combine the members of the farming class as such.

These natural divisions give us the cue to the present discussion. We shall attempt to keep in mind chiefly those organizations designed to serve the general interests of the entire farming class. In the brief historical review it will, however, be pertinent to outline the successive steps in the evolution of these general organizations; consequently the miscellaneous associations such as agricultural fairs and horticultural societies will be mentioned—they are local but widely spread associations, type forms of coöperative effort. But we shall not discuss them at length. Similarly, we shall not attempt a history of the efforts to achieve business coöperation, because those efforts have been often sporadic, as a rule local, and usually quite limited as to specific industrial interest. In so far as they have been attempted on a general or class scale, they come within the scope of this discussion. In a word then, a farmers' organization is a combination of a considerable number of farmers, over a fairly wide area, for some large general purposes of supposed value to farmers as a class.

Value and need of farmers' organizations.

(1) Organization is a powerful educational force. If it accomplished no other result, it would be worth all it costs. Every coöperative effort among farmers stimulates discussion, arouses interest in fundamental questions, makes abstract questions concrete and vivid, trains individuals in self-expression, and socializes the isolated farmer.

(2) Other classes are organized. Business, the trades, the professions are all organized to some degree, for many purposes—cultural, political, sociable, industrial. It is reasonable to suppose both that these organizations flourish because they serve a human need, and that if valuable for others than farmers they will be of aid to farmers. The element of self-defence inevitably enters in also. An organization is sure to be utilized for the particular advantage of the group or class represented by it. If there comes a clash of class interests, the unorganized class must suffer from the concentrated power of the group coöperation of its opponents. In the group competitions sure to arise, the farmers need the strength that organization confers, for securing legitimate group advantages, for defence against the aggressions of other groups, and for utilizing the class strength in the general public interest. It is hardly necessary to assert that organization multiplies many-fold the powers of any class of people. It was perhaps true, when the great majority of our people lived on the soil, that organization for farmers interests was unnecessary. Now that the farming class is, rela-

tively to other classes, losing ground, it becomes imperative that they shall combine their individual strength.

(3) The general tendency of the age toward social self-direction; which is another way of stating more formally and scientifically, and which presses a little farther, the argument just advanced that farmers must organize because other classes are organized. This process is not to be out of mere imitation. Society, as a whole, is more and more the helmsman of its own fate. This is accomplished at present, not by a unified campaign, by society as a whole, for some distinct social goal, but by the attempts of separate groups, often apparently antagonistic to one another, to seek group or class interests or to endeavor to fix upon society the special idea or ideal of the group. It becomes then necessary for the best interests of society as a whole, as well as for the class itself, that our farmers shall seek through organization to give wing to their best ambitions for the benefit of society, as well as to determine the direction which rural progress itself shall take.

(4) Organization, in the light of the social principle just enunciated, becomes then a test of class efficiency. Has a class initiative, self-control, capacity for leadership, ability to act coöperatively and fraternally, social vision, true patriotism? The activities of the class organizations will answer these questions.

(5) Organization tends in the same way to preserve as well as to test the social efficiency of the farming class, and hence becomes a vital factor in the rural problem, which is nothing more or less than the preservation and strengthening of the status of the rural people, industrially, politically, socially.

Possible disadvantages of farmers' organizations.

(1) They may tend to emphasize undesirable class distinctions and foster class antagonisms. It is to be remarked that, in the development of society, these group competitions are inevitable. Temporarily they may be antagonistic and rival; ultimately they can and must be made supplemental, coöperative, seeking the general good. But farmers are a class. They have special interests. They simply cannot maintain their common rights unless they invoke the power that springs from class organization. The danger of undue class distinctions can be obviated by the full recognition of the fact that each social group or class has duties as well as rights. Farmers must be led to unite their class power for the national welfare. This is one of the chief functions of a farmers' organization.

(2) Organizations may be unwisely led, or advocate impossible things. This is a real danger; it is not a final argument against organization. The child blunders day in and day out in its education. A social group is sure to do the same. It is the only road to wisdom, social as well as individual. Education, experience, and time will tend to adjust these difficulties and minimize the dangers.

(3) There may be over-organization, and the individual may lose his identity. This is also a real danger in our day among all classes. It is less likely to be serious among farmers because of their strong tendency to individual independence.

Difficulties in organizing farmers.

(1) *The ingrained habits of individual initiative.*—For generations American farmers have been trained to rely upon themselves. The farm family was for many decades an industrial as well as a social unit, and indeed is so to a large degree even today. The pioneer farmers developed some rude forms of coöperation in the neighborhood life, but each man was responsible, almost as much as is the hunter, for his own success. This experience has become a habit of mind, not easily bent to the needs of coöperative effort. So strong is this trait that it has produced in many cases a type of man actually unsocial, unwilling as well as unaccustomed to work with and for his fellows. Neighborhood jealousies and feuds in the rural community are proverbial. Farmers seem to be extremely suspicious of others' motives. Not seldom will they refuse the primacy of leadership to one of their own class. They have been known to repudiate the bargains of a coöperative pact for the sake of individual temporary gain; such action was unsocial rather than immoral, but it is disastrous to organized effort.

(2) *Financial considerations.*—Economic pressure has created a desire to secure financial relief or gain, and if coöperation would accomplish that it would be welcomed. But too often the large view of the ultimate value of the educational and social features of rural organizations has been lost sight of, and the farmer has refused to contribute to a movement with such intangible aims and distant results. He wanted to see where even his slight investment of time and money was going to bring him its harvest. Farmers have not appreciated what the economist calls "culture-wants."

(3) *Economic and political delusions.*—The history of farmers' organizations in the United States shows that the great "farmers' movements" have gained much of their power because there existed an intense belief in certain economic and political ideas which seemed to promise release from what the farmers honestly felt to be industrial bondage. These ideas strike at real evils, but in an extreme form at least proved inefficacious, are considered by students to be intrinsically unsound, and indeed have always been regarded by a large proportion of leading farmers as unsound. These delusions were mainly three: (*a*) That the middleman may be entirely abolished and that farmers as producers may sell to customers without the intervention of a third party, and as consumers may also produce for themselves coöperatively. (*b*) That unsatisfactory business conditions are almost wholly due to faulty legislation, and, that a farmers' party is not only feasible, but is necessary in view of the way by which other interests have secured special legislative privileges. (*c*) That a satisfactory money can be made by government fiat.

This is not the place to discuss these questions. They are set down as delusions, because as practical propositions they have not been made to work advantage to the farmers. It must not be supposed that all farmers' organizations have urged these views, nor indeed that the majority of American farmers have believed in them. But they have all been proposed as measures of relief for real difficulties; they have never worked results permanently helpful to the farmers, and they have wrecked every farmers' organization thus far that has pinned its faith to them.

(4) *Lack of leadership.*—Organization among any large group of people means leadership. The farm has been prolific of reformers, fruitful in developing organizers, but scanty in its supply of administrators. It has had the leadership that could agitate a reform, project a remedial scheme, but not much of that leadership that could hold together diverse elements, administer large enterprises, steer to great ends petty ambitions. The difficulties of such leadership are many and real. But it is to be doubted if the business of small farming is a good training-ground for administrative leadership. At any rate, few great leaders have appeared who have survived a brief record of influence.

(5) *Lack of unity.*—A difficulty still more fundamental remains to be mentioned. The farmers of America have never been and are not today a unit in social ideals, economic needs, or political creeds. The crises that have brought great farmers' organizations into being have shown the greatest diversity of views as to remedies for existing ills, and, in most cases, there has not been in any farmers' platform sufficient unanimity over even a few fundamental needs to tide the organization over to the time when a campaign of education could have accomplished the task of unifying diverse views.

THE HISTORY OF FARMERS' ORGANIZATIONS

Prior to 1870, there did not exist in the United States a single farmers' organization, in the strict sense of our definition. Nevertheless, for more than seventy-five years farmers had coöperated in a multiplicity of ways and through a multitude of societies. Their early efforts differed entirely in scope and purpose from the great farmers' organizations of the eighth and ninth decades of the last century, but they paved the way for such organizations and, in many respects, they served the purposes of those organizations, particularly with regard to their educational features. We must, therefore, catalogue briefly the early attempts at associated effort among our farmers. It will be convenient to divide this historical review into four periods, as follows: (1) From 1785 to 1850—the period of beginnings; (2) from 1850 to 1870—the golden age of the agricultural fair; (3) from 1870 to 1892—the farmers' movement and the era of great organizations; (4) from 1892 to the present—the period of adjustment.

1. *The period of beginnings*—1785–1850.

In colonial days there was apparently no call for associated effort among farmers. The farm was largely self-sufficing and farming meant little more than to clear the land and to raise enough to live on, with a small surplus for barter. There was no commercial agriculture, no "market." It is significant that when the first agricultural society was organized, it was the result of the vision of statesmen who saw the importance of agriculture in the economy of the new nation, rather than an expression of the need of the working farmers themselves.

The efforts at association during this period, consisted principally of the organization of the early agricultural societies, perhaps a dozen, all told, prior to 1800, beginning with the Philadelphia and Charleston societies, in 1785; in the inauguration of agricultural fairs, beginning with a temporary project in Washington, in 1804, and including the permanent organization of numerous fairs and "cattle-shows" all over New England and even in the Middle states; and the establishment of local farmers' clubs, wherever the farmers felt the need of coming together for discussion of questions of common interest.

The first societies for promoting agriculture.—The first of these societies to be organized was the Philadelphia Society for Promoting Agriculture, established in 1785, which included in its membership George Washington, Benjamin Franklin and Timothy Pickering. Later in the same year a similar society was organized at Charleston, S. C. These were followed by the Kennebec, (Maine) society, 1787; Kings county, Nova Scotia, 1789; New York City, 1791; Massachusetts, 1792. By 1800 there were perhaps a dozen of these societies near the eastern seaboard, mostly in cities.

The Kennebec society is unique in that it was organized by farmers. It was intended for mutual improvement in agriculture and mutual aid, by the importation of stock, implements and seeds. It held frequent meetings for the reading and discussion of papers by members and for general consultation. At the start it held no fairs. These early societies were undoubtedly modeled after the British societies. Washington's wisdom and influence had much to do with these beginnings. He had corresponded with distinguished Englishmen relating to their societies, and became an advocate of similar societies here. In his last address to Congress he called attention to the primary importance of agriculture and urged public financial support for institutions designed to aid the industry. He advocated the establishment of agricultural fairs, and favored a national agricultural society with congressional aid.

The beginnings of the agricultural fair.—Washington urged the inauguration of agricultural fairs as early at least as 1796. In 1801, the Massachusetts society suggested a fair with premiums, twice a year, on Cambridge common. The first fair actually held was an exhibition in Washington, lasting three days, beginning October 17, 1804. In April of the next year, the fair was repeated and premiums were offered. In November, 1805, another fair was held, when the plan was discontinued. In 1807, Elkanah Watson of Berkshire county, Mass., is said to have exhibited two Merino sheep in the public square in Pittsfield. In 1808, began the annual sheep-shearings at "Arlington," the estate of George Washington Parke Custis. These were social gatherings of prominent people, but aimed also to promote the sheep industry.

Elkanah Watson may well be called the "father of the agricultural fair." He secured a petition of twenty-six farmers for a cattle show, which was held in Pittsfield, Mass., in October, 1810; this led to the incorporation the same autumn of the Berkshire Agricultural Society, which thus became the first permanent fair association in the United States. Watson seemed to make a sort of propaganda out of this idea, and helped organize similar societies, not only in New England, but in some nine or ten other states. In 1809, there was organized a "national" society for the promotion of rural and domestic economy, called The Columbian, which in 1810, and for five succeeding years, held a "national" fair with quite liberal prizes.

Probably the first state aid for agricultural fairs, and doubtless also the first substantial state aid for agricultural education, came through an appropriation in 1819, by the legislature of New York, of $20,000 for two years, to be divided among county agricultural societies. Other states followed the plan. In 1822, for instance, there was organized the Pennsylvania Agricultural Society, which held quarterly meetings at Morristown, and an itinerant annual exhibition and cattle show.

Other associations of the period.—In 1828, "The American Institute of the City of New York" began its career of publishing valuable annual reports relating to industry, including agriculture, which continued until the Civil war. In 1839, the farmers in the Massachusetts legislature met weekly during the winter session to discuss agricultural questions and the practice continued for nearly thirty years. The same practice held in some other states. In 1846, a state agricultural convention was held under the auspices of the Ohio Board of Agriculture, which became a permanent annual affair.

Farmers' clubs.—This period saw also the inauguration of the numerous farmers' clubs. No data exist to show their origin. They were often connected with fairs, but as a rule were for social and educational purposes.

Purpose of the associations.—In general, the associations for the promotion of agriculture in this period were intended for technical education; they were designed for the purpose of learning and diffusing better methods of farming. The sociable idea had a large place also, in practice if not in theory. There was little idea of general culture, apparently none of business coöperation except in isolated cases, very little attempt to influence state or federal legislation, and scarcely a suggestion about a great organization of farmers on a national scale. Doubtless all these ideas were discussed and probably advocated, but they were not virile enough to crystallize into institutions.

II. *The golden age of the agricultural fair*—1850–1870.

Number of societies.—In 1858, the United States Patent office printed a list of over 900 agricultural and horticultural societies. At least five-sixths of these were established after 1849. In 1868, the Department of Agriculture had a list of about 1350, all but approximately 100 of which had been established since 1849. Undoubtedly many such societies in the South went out of existence during the war, so that the development of this form of organization in the North must have been very rapid. They were relatively most prominent in the East, but had become very popular in the West also. In 1857, there were in New York 97 such societies, in New England 95, in Illinois 94, in Iowa 74, in Ohio 74, in Pennsylvania 71. In the decade 1850–60, most of these societies were state or county organizations, and the holding of fairs was their chief object; in the next decade, the list included many township organizations some of which held fairs and some of which were farmers' clubs. In 1868, New York had 39 county agricultural and horticultural societies, and 66 township societies.

Value of the fair.—During this period, the agricultural fair was the predominating form of associated effort among farmers. It performed a great service in diffusing new ideas, in creating an atmosphere of social unity, and in introducing better methods of farming, new types of stock, grains, and fruit and in furthering the use of farm machinery. The educational feature was prominent. In Massachusetts, for instance, men like Webster, Everett, Emerson, and Thoreau delivered addresses. The affair often included horse-racing and was a gala day, but it had a serious purpose and did a great work. It was for all this period the chief institution for the formation and expression of rural opinion and for the conservation of rural interests. This period also saw the rapid multiplication of farmers' clubs, the chief function of which was to discuss topics of farm and general interest. They were purely local in character.

National movements.—During these years occurred also the beginnings of great national movements. There are records of two or three meetings in 1841–2, in Washington, of a convention representing a number of states; it was called the Agricultural Society of the United States. The United States Agricultural Society, in 1853, had a national convention in Washington with 152 delegates present from twenty-three states and territories, and it held annual meetings for ten or twelve years.

Organized effort against evils.—We also find in this period the first bubblings of discontent among farmers, and the first definite suggestions of organized effort as a remedy. In 1853, a speaker before the New Hampshire Board of Agriculture remarked that "the only reason why the farmers of America are without power is because they have never learned to act in concert." This idea took form in 1858 in a convention of farmers at Centralia, Ill., which discussed such questions as monopoly, freight charges, and the like. It passed strong resolutions urging more direct relations between producer and consumer, stating that farmers should have more voice in fixing prices, that middlemen get too great profits, that their profits and the practice of speculation tend to produce business panics, and that lawyers are not the proper men to enact laws for farmers. The program of reform included the organization of farmers' clubs wherever practicable, the establishment of the ready-pay system, the formation of wholesale selling and purchasing agencies, the creation of a federal agricultural bureau for accurate gathering of crop statistics, election of "producers" chiefly to positions of honor and trust. The war interrupted the progress of any concerted movement that might have grown out of this convention, but the declaration of grievances and the proposed remedies have precisely the same flavor as those voiced fifteen and thirty years later.

General character of period.—In general, this second period showed a wonderful development of associated effort. Agriculture was fast becoming a commercial pursuit. The increasing production of the West pressed upon eastern farming; soil exhaustion in the East began to show itself; plant- and animal-breeding and improvement attracted wide-spread attention; the economic questions of price, transportation, methods of distribution of products, came up for discussion, and the effects of all these factors began to call for political debate and the suggestion of legislative adjustment. The educational features of associated effort were dominant, however; the agricultural fair typified the prevailing idea of the need of the rural people.

III. *The farmers' movement, and the era of great organizations*—1870–1892.

We have already seen that before the Civil war mutterings of discontent were heard among farmers. After the war there ensued a period of rapid expansion of industry as well as much speculation. The lands of the West were rapidly settled, railways pierced great empires of virgin soil, agricultural production increased far beyond the market demand either at home or abroad. The farmers of the West were entirely dependent upon the railways for marketing their crops; prices seemed unduly low, transportation rates unduly high. No doubt there was serious and unjust discrimination in railway rates. The attitude of the railways, both of management and of employees, was one of indifference to public demands or rights.

Farm machinery was just coming into general use, and was costly to manufacture. Farmers had little capital, but needed the machinery. The credit system flourished, and interest rates were abnormally high. The farmers came to feel that the "middleman," whether he acted as between the producer of the crop and the final purchaser, or as between the manufacturer and the farmer, had too much to say about prices and received a reward disproportionate to his service.

The owners of capital, however, were not exempt from serious criticism. Angry expostulations against "monopoly" were heard on every hand. The theory flourished that farmers and laborers were the only producers, and that the "non-producers" were not only getting an abnormal economic profit, but were able so to shape legislation that their interests rather than those of the "producers" were subserved.

The weapons which the farmers proposed to use were substantially four: (1) The power of combined effort through formal organization. (2) The election of representatives to the legislatures and to Congress who would advocate measures of relief. For the farmers believed that most of the evils that burdened them could be remedied if the strong arm of the law should intervene. Railway rates, interest charges possibly, the granting of subsidies and franchises, the prevention of combinations intended to eradicate competition, they believed could be fixed or controlled by proper laws. (3) Coöperative buying, selling, and even manufacture, which should entirely eliminate the "middleman" and place his profits in the pockets of the farmers, whether they sold or bought. (4) Education, by which was meant both formal instruction of youth for agriculture in schools and colleges, and the informal education in economic and political questions arising from discussion and agitation.

These, in brief, were the causes of the farmers' movement, and the program of reform in which the farmers placed their faith and which gave the movement vitality. The institutions or organizations that were developed for carrying out the program were, in general, as follows: (1) Conventions, for the agitation of the "burning questions" of the day; (2) the great associations of farmers; (3) the formation of what was essentially a farmers' party; (4) conventions chiefly for the discussion of the larger phases of agricultural progress; (5) coöperative efforts of a business character, either as a phase of the work of great organizations or as local schemes.

(1) *Farmers' conventions.*

The Centralia convention of 1858 was the precursor, in type and in method, of a series of such meetings. The most notable among these were held at Bloomington, Ill., in 1869; at Kewanee, Ill., in 1872; at Washington, D. C., February, 1872; at Bloomington again, in January, 1873; at Topeka, Kan., March, 1873, when a permanent organization was formed; at Springfield, Ill., in April, 1873; the Farmers' and Producers' Convention, in New York City, May, 1873, which elected Josiah Quincy, of Massachusetts, as president of a permanent association and which met again in Washington, in January, 1874; and in October, 1873, a convention composed of about three hundred delegates from the states of Illinois, Wisconsin, Iowa, New York, Indiana, Nebraska, Minnesota and Canada, was held in Chicago under the name of Northwestern Farmers' Convention.

At each of these conventions, substantially the same list of grievances was ventilated and the same appeal to the masses of farmers to organize in behalf of their rights was promulgated. The Illinois conventions were particularly significant because, in that state, they were so closely connected with an attempt to control railroad rates by legislative enactment.

"The Agricultural Congress" convened in Atlanta, Ga., in 1870, with eleven states represented, and at Selma, Ala., in December, 1871. At the second meeting a union was effected with "The National Agricultural Association," which had organized at Nashville, Tenn., in the autumn of 1871. The new association, known as "The National Agricultural Congress," met in St. Louis in 1872, in Indianapolis in 1873, in Atlanta in 1874, in Cincinnati in 1875, and in Philadelphia in 1876. At the Philadelphia meeting about one hundred and thirty delegates represented twenty-two states. The Congress at all its meetings discussed a wide range of topics, including the educational as well as the political and economic.

In 1875 was organized the East Tennessee Farmers' Convention, which is still in existence.

(2) *The great farmers' organizations.*

(*A*) *The Grange.*

The Grange (officially the Order of Patrons of Husbandry) was organized in Washington, D. C., in December, 1867, by O. H. Kelley and six of his friends. Mr. Kelley conceived the idea and for some years gave all his time to a campaign of organization. It was not until 1873 that a national grange as a delegate body convened. The meeting was in St. Louis, Mo. At this time, the "Declaration of Purposes" was adopted and the official history begins.

Organization.—The Grange is a secret fraternal organization of men and women, including youth, ostensibly of those only who have a direct interest in the industry of agriculture. The unit of organization is the local lodge, or subordinate grange. "Pomona," or county granges represent larger areas and are composed of members of the subordinate granges, but have little official jurisdiction. The state grange is made up of delegates, either the "master" of each subordinate grange (and his wife if he has one) or delegates representing a certain district. The state grange master and his wife are the official delegates to the national grange. This body has final jurisdiction in all matters concerning the order, but leaves details largely to state granges.

The expenses of the granges—subordinate, state and national—are met by small membership and charter fees, and by dues of ten cents a month for each member. These small sums have sufficed to pay all running expenses and leave in some state grange treasuries and in the national grange treasury a handsome surplus. Local granges of course raise money in other ways for special purposes; many own their halls.

Purposes.—The purposes of the Grange include the fraternal, the sociable, the educational, the political and the financial. There is a process of initiation, passwords and "grip." The fraternal feature was adapted frankly from the Masonic order, but it is limited in extent. The sociable feature is developed through the semi-monthly meetings, frequent feasts, and at the Pomona and state granges; also by intervisitation of the subordinate granges. The educational work is carried on through a regular feature of each meeting—the lecturer's hour—when that officer takes charge of a program ranging from readings and recitations to addresses and debates. In some states, the state grange lecturer leads a systematic form of study among all the granges of the state.

The Grange is absolutely nonpartisan, and its political influence comes largely through its plan of presenting to the state legislatures and Congress, in the persons of an authorized committee, the official views of the Grange on pending questions or on bills specially prepared to embody those views. The financial end is gained chiefly through forms of mutual fire insurance, and the coöperative purchase of supplies.

History.—Mr. Kelley's early efforts were fraught with discouragement. It was not until the Grange was caught up in the tide of affairs that it came to influence. We have seen that for the four or five years prior to 1873 there was a series of conventions held to protest against the conditions described as causes of the movement of the period we are now discussing. Those conditions grew constantly worse and were capped in 1873 by an immense corn crop and the panic of that year. Corn was not worth transporting to the seaboard and much of it was burned for fuel. Railway freight rates seemed to stand in the way of sales at any figure. It was held by the farmers that the panic had been caused by the same speculative forces that they held responsible for prices of their commodities.

In the same year, 1873, the national grange promulgated its declaration of purposes. Here was a compact organization, built on lines that had been advocated strongly for some years and vociferously in recent years, made up of farmers, national in scope, with a platform that, while conservative in tone, seemed to embody the principles for which the masses of farmers were contending. This combination of circumstances was remarkable in its results. The grange began to grow by leaps and bounds. The three years 1873-5 witnessed the organization of 20,000 subordinate granges; Iowa and Missouri each had 2,000 within its borders.

The decline of the Grange was as rapid as its sudden rise to power. In 1876, there was some evidence of weakness; by 1880, the Grange was pronounced dead. It was not true; but its great power was gone. In the South and Middle West particularly, where it had been very strong, it became nearly extinct as an order and quite useless as a general farmers' organization.

The causes of this rise and decline are fairly clear. The Grange was set before the farmers as a fully organized piece of social machinery at the precise time when they most keenly felt the need of such an organization. They rallied to a standard that seemed to promise relief from their grievances.

The causes of decline lay in an overestimation of the power of any organization to procure legislation that would correct the evils complained of, and, indeed, an undue reliance upon legislation itself as a cure for the trouble; in the fact that many unwise attempts at business coöperation failed ingloriously: and in the inability of the order to assimilate at once such tremendous increases in membership. Members came more rapidly than they could be educated to the real work of the grange and trained to patience and self-control. Grange organizers were paid for their work and probably set forth unwisely the possibilities of the order. Many farmers joined expecting an early and large financial benefit. The Grange thus became first the organ and then the victim of a great reform wave among the discontented farmers of the land.

The Grange nobly survived the shock and has at last come to a recognized position among the social agencies of the day. But at the end of the period we are describing it was merely keeping alive, save in New England alone.

(*B*) *The Farmers' Alliance.*

The Grange had lost its hold, but the farmers' movement retained its vitality and sought other means of expression. This was finally found in another great organization, officially called "The National Farmers' Alliance and Industrial Union." Though having a distinct history of its own, it ultimately absorbed several minor organizations.

The Agricultural Wheel.—The first of these to be established was probably The Agricultural Wheel, organized in 1882, in Arkansas. In 1887, the National Wheel convened and claimed a membership of 500,000 in the states of Arkansas, Missouri, Texas, Tennessee, Mississippi, Alabama, Kentucky. It was a secret order for white farmers. It disclaimed being a political party, but placed large emphasis upon its possible power in shaping legislation, and, in 1888, sent a communication to the national Democratic convention calling attention to its demands. In the same year it was absorbed by the Alliance.

The Brothers of Freedom was organized in Arkansas, in 1882, and in 1885, with 600 lodges, became a part of the Wheel.

The Farmers' Union was started in Louisiana from a farmers' club and became a state body in 1885. It was consolidated with the Alliance soon after. In Kansas, a somewhat similar independent body was developed and taken into the Alliance.

The Alliance proper.—It has been claimed that as early as 1872, Kansas settlers organized a coöperative association to sustain their land claims and to purchase supplies. The New York Alliance was organized in 1875. The germ of the great organization is, however, to be found in local efforts made in Texas about 1874 or 1875. The Lampasas County Alliance was organized early in 1878 and the state alliance in May of the same year. This particular organization disbanded, but the name and fundamental plan of organization were soon revived and, in 1880, the scheme was fully launched and grew in numbers and strength until, in 1887, it came under the presidency of Dr. C. W. Macune, who at once began a campaign of extension and organized a national alliance.

The Alliance was a secret order, at first restricted to male membership, though women eventually were admitted. There were local, county and state alliances. The National Alliance had legislative powers vested in a supreme council, judicial powers residing in three judges, and an executive with large powers. In addition to farmers, country teachers, preachers and doctors, even mechanics living in the country, and agricultural editors holding alliance views, were admitted to membership. Politics of a partisan character were to be rigidly excluded. There was, however, an intense belief in the need of legislation to redress wrongs and, in the power of organized effort, to secure that legislation. The declaration of purposes sounds very much like that of the Grange, though briefer.

The Alliance was strongest in the South, with a large membership, however, in the Middle West. At the 1890 meeting there were delegates present from twenty-seven states and territories. The later history of the Alliance becomes actually a record of a farmers' party.

(*C*) *Minor organizations.*

The Colored Farmers' National Alliance and Coöperative Union was organized in Texas, in 1886, and spread rapidly through the South, claiming, in 1891, over 1,000,000 members. The national organization was perfected in 1888.

The Northwestern Alliance, as it was sometimes called, was strictly a northern institution. It was organized in Chicago, in 1880. It never secured as large a membership as the Grange or the southern Alliance, although at one time it claimed 400,000. It was non-secret, admitted any one born on a farm, whatever his occupation, and charters were sent out rather indiscriminately to applicants. There were no fees or dues. An attempt was made at one time to unite it with the southern Alliance.

Farmers' Mutual Benefit Association.—This was organized in Illinois in 1883, and developed as a "national" body in 1887. It spread into adjoining states, and at one time claimed a membership of 150,000.

The Patrons of Industry originated in Michigan about 1887. It was modeled largely after the grange. It spread into Ohio, New York, Indiana and Wisconsin. It was supposed to be non-partisan, but finally engaged in politics, nominating candidates for the Michigan legislature and electing several. Soon after 1890 it began to decline, and became practically extinct.

The National Farmers' League started in 1889, in Massachusetts. It was frankly political in the farmers' interests. It had a very brief existence.

(3) *A farmers' party.*

It is difficult to say just to what extent the different organizations of farmers used their newfound power to influence the voting for party candidates. All the stronger bodies persistently disavowed all connection with political parties and denied any purpose to use the organization for partisan ends. In one sense, it is unfair to these organizations to suggest that they resulted in a farmers' party. As the Grange had been swept from its moorings by the current of a popular enthusiasm, so the Alliance became involved in a distinct party movement in spite of constitutional inhibitions and official protestations.

As early as 1873, the farmers of Illinois had caused the defeat of Judge Lawrence because of his decision in the railway rate case, that the control law enacted was unconstitutional. From time to time, legislative and congressional campaigns in various states were enlivened by the independent attitude of bodies of farmers. The Alliance had such power, covered such a wide territory, and laid so much stress on radical legislative measures that almost inevitably a third-party movement grew out of it. The Alliance held a large meeting in St. Louis in 1889. Its platform had the formal endorsement of the Knights of Labor and contained planks demanding: (1) The abolition of national banks; (2) prohibition of dealing in futures; (3) free coinage of silver; (4) prohibition of alien ownership of land; (5) equal taxation and reduction of public expenditures; (6) fractional paper currency for use in the mails; (7) government ownership and operation of means of communication and transportation.

In 1890, at Ocala, Fla., the platform was endorsed and resolutions were adopted calling upon local alliances and all officers to support the platform unequivocally; advising members to vote for no candidate for Congress who would not pledge himself to the platform; modifying the government ownership plank to rigid control by state and nation and ownership only as a last resort; incorporating in the platform a provision passed at St. Louis the year previous in favor of subtreasuries to loan money to the farmers; favoring a graduated income tax; for election of senators by direct vote. The reluctance of either of the old parties to incorporate these demands in their own platforms incited the powerful Alliance, backed by the Knights of Labor, to still more radical action, and in 1892, at Omaha, a convention was called to nominate a ticket favoring the Alliance platform. Thus, the "People's party" came into existence, and in the national election that year cast 1,250,000 votes, and elected eight congressmen.

(4) *Conventions for discussion of agricultural questions.*

In 1871, an important meeting of the "friends of agricultural education" was held in Chicago. In 1879, there convened in New York about one hundred and thirty prominent leaders to form the National Agricultural Association. The object was broad and the scope national. Several annual meetings were held. It was hoped to utilize the charter of the United States Agricultural Society. Interstate agricultural conventions were held in Illinois in 1880.

Commissioner of Agriculture Loring convened several meetings at Washington. In 1882, twenty-one states were represented. The discussions were largely concerned with the work of the agricultural colleges and with the newer applications of science to agriculture. The next year there were 122 delegates present from thirty-two states and territories.

The Farmers' National Congress probably grew out of the old "National Agricultural Congress." In its present form it dates from about 1880. It has held annual meetings since that time. It is probably the largest delegate convention of farmers in the country. The voting membership consists of one delegate from each congressional district, and two at large, in each state and territory, and one from every agricultural college,—these to be appointed by the governor. State or national societies intended to foster agriculture may also elect delegates. Any governor may appoint as many associate delegates as he chooses to name who may have all privileges but voting. The officers receive no pay, the delegates pay their own "meet" expenses instead of "pay" expenses. The annual meeting is usually well attended and the resolutions passed are usually conservative and representative. The Congress has had a great deal of influence in federal legislation in the interests of the rural people.

(5) *Business coöperation.*

Practically all of the large farmers' organizations endeavored to develop some phases at least of business coöperation. In the early days, the national grange gave much study to the problem, and experimented with nearly all forms. It evolved a very elaborate plan to include a system of sales and purchasing agents. The Ohio Central Business Agency was one of the most elaborate of these schemes, but it proved a failure. The Johnson County (Kansas) Coöperative Association was organized in the early years, on the Rochdale plan, and has been and is a conspicuous success. In nearly all the states where the Grange was strong, coöperative stores were started under Grange auspices. In some cases, attempts were made to manufacture farm machinery. When the Grange declined, of course these business ventures declined also. Some of them were foredoomed to failure.

The Alliance also attempted to develop the coöperative idea with respect to purchases, and quite elaborately with respect to sales of cotton. There were isolated cases where conspicuous success resulted, but the business interest was soon overshadowed by the political.

Summary of the period (1870–1892).

This period was a remarkable one in the annals of farmers' organizations. It had seen the rise and decline of two great bodies and several minor ones; for after the formation of the Populist party the Alliance soon broke up and in a few years hardly a vestige of it was left. The farmers had proved the power of organized effort but had not shown their ability to keep together for a period of years.

But these attempts were not without real results in public policy. The early decisions of the courts that the public could control railways, even to rate-making, were brought about by the farmers' movement. The Interstate Commerce Commission, established in 1887, grew in part out of the demands of the farmers. Indeed, it is not too much to say that the present political program of social reform is the outgrowth of the demands voiced by the farmers and laboring men during the period under discussion.

IV. *The period of adjustment*—1892–1908.

(*A*) *The Grange.*

A revival in grange work began about 1890. In New England the order had had a slow but steady growth from the beginning and had not been swept into the excesses of 1873–75. The social and educational features of the Grange finally made their appeal to the better farmers, and in the Middle states and New England there has been a rather rapid and apparently a permanent growth in numbers and influence. The successful development of grange fire-insurance and of the coöperative purchase of supplies has had something to do with this growth. But the broad platform of grange principles has proved its worth, and the Grange is stronger today than ever before in its history. It is not so strong as it should be in the South and West, but it is, more fully than any other association, a national farmers' organization.

(*B*) *Farmers' clubs.*

We saw that these clubs were organized freely during the middle of the last century. In Illinois, about 1873, there was a state association of clubs. In Michigan, about 1893, a state association was formed, and it was found that there were several hundred clubs in existence. This association still exists. In most states numerous clubs exist, but as a rule have no organic connection with other clubs.

(*C*) *Farmers' societies.*

One of the first means of bringing farmers together was through a society representing some special interest in agriculture. As the business became specialized, these societies grew in numbers and influence. They have been especially prolific during the past twenty years.

Summary of the period (1892–1908).

As a whole, the period has been one of prosperity for the farmers. The radical agitations of the previous period have not been repeated. The value of associated effort has been fully appreciated and on the whole well utilized. There has been an adjustment of rural public opinion to more conservative methods of reform.

Conclusion.

The farmers are not fully organized; the difficulties of organization are real. But there has been during all these years a vast amount of coöperative effort, which has done its work quietly. There ought to be a representative farmers' organization which can speak for the rural interests of the nation. It is to be hoped that the Grange will be able to push its work into the South and West, where lies the future of agricultural development, and become in fact the great farmers' organization.

THE COUNTRY CHURCH

By *George Frederick Wells*

The churches of the United States may be put into three general classes—city, town and country. City churches may be called those in urban centers of 20,000 or more people. Town or suburban churches exist in general in towns ranging from 2,000 to 20,000 in population.

Definition of country church.

By country churches we mean those in localities where rural conditions persist and dominate. Chapel churches by the cross-roads and in small agricultural hamlets are country churches. Churches in villages which may have small manufactures, high schools, the beginnings of wealth and a good degree of social selection, are country churches. It is becoming less true that a church must be made up of farmers in order to belong to the country church class. More and more people employed in cities and towns are seeking country homes and the openhearted cordiality of rural worship. On the other hand, well-to-do rural people are bringing their church life to conform to the town or urban type. Many country churches are made up exclusively of people who work in factories, mines and quarries, or who engage in commercial pursuits. If one desires an arbitrary line between town and country churches, he may place in the latter class all churches in townships of 2,000 or fewer inhabitants. He will then, probably, include as many churches of the town type as he excludes those typically rural. The purposes of this article, however, lead us to confine our attention most largely to the church life of the agricultural people.

The first stage of rural society.

Agricultural society in the United States has had three stages or forms. These must be noticed before we can understand the conditions of the churches of rural inhabitants. They become evident to us when we look at rural life from the standpoint of its leading institutions. The first of these tendencies or forms is that of unity or solidarity. In Europe and the eastern world, the village community has stood for this social type, but in America the old New England town is its best example.

Wherever the religious, economic, educational and political interests of the people are all represented in a single organization, such as the village or church community in Puritan society, there we find true social solidarity. Every neighborhood by itself is an empire. Every inhabitant is both a church member and a citizen, and one because he is the other. With his neighbors, he shares in comparative equality the products of the soil and the means of knowledge and personal enjoyment. Though this type of organized society never in all its dimensions prevailed in the early colonies of the South, nor in the society that was transplanted in the middle West from France, nevertheless the moral strength of this particular social form has given it such influence as easily to result in a type.

There are yet remaining in the rural parts of the eastern states many communities that still preserve many of the dimensions of social solidarity.

The stage of diversity in rural society.

The agricultural society of America, however, has been formed from more than one European nation and effected by more than one religious persuasion and social system. Not only England, but France, Holland, Spain, and even Africa, have had to make their contributions. The products of the intellectual renaissance and the religious and moral reformation were transplanted with the people upon the hitherto untilled soil. So the second tendency, that of social diversity and competition presented itself in the life of the new nation. Nothing else could happen when a pure democracy like that formed in the Mayflower, when the humblest servant signed the sacred compact of state, mingled with the money-loving aristocracy from the South, where the gentleman ruled and the enslaved African and the white outcasts from Old World slums and prisons did the work.

It has taken decades for religious and social tolerance—first rooted at Providence, Rhode Island—to spread its mantle of charity, which even now is often threadbare and torn, across the contentious colonies and their proud successors. The peaceful Quakers of Pennsylvania met with persecution from both high church ecclesiastics and liberty-loving Puritans in the new world as well as in the old. In fact, the period of national growth had hardly commenced before America had become a great experiment station where contending creeds and social customs were tested in the crucible of life for their real merit.

What is the surprise, then, that early in the nineteenth century the former solidarity of the town was broken and instead of one town church—which was in reality the town itself—there were rival societies, and in the place of the common village school a township surveyed into twelve or more school districts? This striking breaking up of working social forces seemed to be a necessary step in the education of a new national character. Thus the country churches have tried to do their work under the condition of a pronounced social disintegration. We trust that the time has passed when we need to engage in "reforming the Reformation, protesting against Protestantism, purifying Puritanism, dissenting against dissent, and dividing, subdividing and re-dividing down to the inorganic dust of individuality itself."

The federal period of the country town.

The third period of the country town is that of federation. This tendency is largely the product of the monopolistic habit of the age. Even though the tendency toward social diversity dawned in America with the factory system of manufacture, it is at last having to give place. Every phase of agricultural life is becoming wrought in the industrial mold. Combination for efficiency is the present watchword. Even the development of handicrafts—that thrust against the prevailing system—is free from neither the spirit nor the method of industrial monopoly. The domains of the farmer, with the help of farm machinery, cover the acres of three or four—or in the West, a hundred—farmers of decades past. The graded school monopolizes the educational interest of larger territories than ever before. The Sunday school, the young people's societies and the Young Men's Christian Association movements have blazed the trail for the effective federation of all religious organizations. The period of practical unification of social and religious interests has only just begun.

Rural exodus and urban growth.

This is not the place to notice in detail the remarkable urban growth of the last century. With Paris and London increasing four-fold, New York more than multiplying its population by fifty in the century following 1790, Chicago gaining 2,000,000 people in the life-time of its first native white voter, the country, as a whole, gaining, for cities of 8,000 or more, from 3 per cent to more than 33 per cent, and with fifteen states having a majority of city dwellers, the fact is sufficiently evident. (Page 113.) We wish to learn the effect of this urban growth upon the country church. This condition constitutes the fundamental dimension of the problem of the country church.

The rural exodus has affected the country church both directly and indirectly. Large numbers of towns have lost so much in both people and wealth that the churches, if they have not been transplanted to urban or western soil, have had to die. Many small towns that have been incapable of developing other than agricultural industries have torn down or closed half their churches. An excessive multiplication of denominations is responsible for a good share of this decadence.

The rural exodus has caused a qualitative as well as a quantitative change in rural society. The most enterprising and intelligent people have migrated only to have their places sometimes, but not always, filled by the incoming foreigners from across the Canadian borders or from southern Europe. There has also been a spiritual change—a change in ideal. Excepting where extreme isolation reigns with its degenerating influences, the spirit of the city has baptized the country town with a profound economic and intellectual quickening. Men's ambitions are more social. Country people, even, have a new world view. The materialism of today has been accompanied by the demand and, better still, the reality, of an unprecedented ethical strength and integrity. It is true that in the country sections of America, evangelical churches and church membership have increased faster than the general increase of inhabitants. Startling conditions of irreligion and immorality are only local and largely due to immigration or unbalanced conditions of life. The acute sense which we have today of the urgency of the spiritual and social needs and perils of rural life is a hopeful indication, for it shows that we are raising the standards. Urban growth from rural sources and rural gains from urban sources have brought great changes and sometimes fatal stresses, but, on the whole, it has not meant decline. The nation, on its rural base, was never so strong as now.

Religious communism in country towns.

Since the country church is concerned with all the religious interests of agricultural society we cannot omit some notice of the communistic societies that flourished a few years ago in several country places. These societies were usually preeminently religious, and when at their best they commanded about as much attention proportionately as the social settlements now hold in the needy portions of the cities.

The communistic societies would have meant more had they been the natural product of our own conditions. Instead, they were the by-products of other conditions asking for our advantages and patronage. The Shakers, a class of celibate Quakers, the first and most successful American communists, were transplanted from England in 1774, and they still persist. The Rappites came to Pennsylvania from Würtemberg, Germany, in 1805, and in 1817 the Separatists of Zoar came to Ohio from the same country, and also because of religious persecution. The Inspirationists came from south Germany to a town near Buffalo, and in 1755 they formed the seven rural Amana communities in Iowa. All of these German communists were peasant mystics.

The French influence in agricultural communism, though foremost in the theoretical literature of the subject, brought forth no marked material results. Mr. J. H. Noyes, founder of the Oneida and Wallingsford communities of short and unsavory record, was a native of New England. As to extent, the Shakers at their best had eighteen communities and perhaps five thousand adherents. Their greatest success was economic, for they had not long existed in organized form before the value of their property had reached the million-dollar mark. Other communistic sects have numbered their followers in the hundreds and sometimes in the thousands, and often held property valued in the millions. But now all forms of communism are rapidly declining.

The message of communism is that of warning. Its fatal mistake has been that of trying to remedy certain extreme conditions by means that were themselves extreme. Nevertheless, it has had a useful mission. Nordhoff says,[1] "But to be fairly judged, the communistic life, as I have seen and tried to report it, must be compared with that of the mechanic and laborer of the cities, and of the farmer in the country, and when thus brought in judgment I do not hesitate to say that it is in many ways—in almost all ways—a higher and a better life." Religious communism in the country towns of America has shown the importance of religion, morality and economic brotherhood—these three in proper relation—and thus it has helped to develop a broader standard of rural well-being.

The country church and missionary enterprise.

The recent writings on the country church question are so largely either pure theory or harsh criticism that we have been inclined to forget one leading phase of the subject. We need to know that in fifty years, while so many country churches in older and remote sections have died, volumes of romantic missionary history have been written. These are about the carrying of the church across the plains and mountains to the frontiers of the far West, or across the gulf of differing customs and languages to the foreigners who are brought to our own villages from foreign shores. If we are disturbed by the problems of religious indifference and moral destitution which face the average rural community, let us notice the sterling missionary enterprise of Sunday-school extension and home-missionary evangelism that is organizing in America scores of new country churches every month.

The value of the fact of territorial expansion is the knowledge that rural needs are not forgotten by the church itself. This rapid spread of the country church calls us especially to regard the quality of the work. That spirit of the age which would lead us to pass unheeded the leaven of evangelism which is working, or should work, in rural society is both prejudicial and unscientific. Evangelism properly understood and applied through the methods of organization, instruction, preaching or devotion, as the local circumstances may require, is the most potent and persistent socializing and spiritualizing force of which the church can avail itself. Evangelism needs to be supplemented and balanced by such a broad and systematic direction of social duties and conditions so that every social force shall be permanently conserved and increased.

The religious status of the rural people.

Before taking up the specific problems of the country church, we want an estimate of the spiritual status of the rural people. In reaching such a judgment, we must record both declension and improvement. The American farmer was at one time preëminently religious. Whether he lived as the child of the Puritan theocracy or as the patron of early Virginian aristocracy, he tilled the soil in order that he might worship God and rear his children in the fear of the Lord. Whether he cleared the forests under Penn, the patriarch of piety, or planted his windmills by the steeples of New Amsterdam, his fireside was his synagogue and his temple the house of prayer.

The time has been when, in some select neighborhoods, at least, the family that never attended church was the great exception, so that the worship at the sanctuary was the worship of the whole community. Now, the place of the country church is not undisputed, even though the church itself exists. The decline has been in the religiousness of the personal character. Though the character ideal was never before so high and large, and the means of reaching it so numerous, yet never before was it so much neglected and the church as a means to it so often forgotten. The problem now is, not so much to get churches for the people as to get the people to church, to spiritualize, through a stronger church, a society that has stronger elements. Though the agricultural classes are far in the rear of their city neighbors in commercial organization, they need to know that a still greater lack is of religious interest and ethical enterprise.

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[1] Communistic Societies, 1875, p. 406.

It is not sufficient to treat the country church, as in our previous paragraphs, simply from the standpoint of social history. This has had, however, the practical value of showing the present resources and needs of the country church. It has cleared the way for a more adequate discussion of the means and ends of the actual problems.

A problem in reality.

The first problem to be considered is the question of life. In a sense, it includes every practical concern within the bounds of the subject. We are faced by the reality that the country church is lost. It has become "sidetracked." It has too far ceased to hold its normal vital relationship to the living interests of the community. It has ceased to exercise its function as the throbbing heart-center of the spiritual well-being of the country town. It has too largely become divorced from its appointed mission of the moral and religious leadership of rural society. In some instances, the country church has stooped to begging for the social and financial patronage of the community, or a part of it, forgetting its obligation of spiritual service to an undivided unit.

Sometimes, in reaching out in special acts of charitable, intellectual or esthetic help, it has gone too far and allowed a secondary mission to displace a primary purpose. Often the churches have been carried away by some particular experience of religious feeling or by over-devotion to single truths, and have then been crippled by consuming fanaticism or withering dogma. It is not necessary to mention every dimension of this problem in reality. The practical need is for a knowledge of the problem, a proper sense of values, and a will to remedy the difficulty. Every tiller of the soil and every intelligent and responsible member of rural society should find the home of his higher life in a living church; and every country church should engage itself in the religious and moral care of every man within its reach.

The federal principle in practice.

We have found ourselves in the federal stage of rural society. At least, we are in the day of the federal ideal. Federation in civil government, in commercial and industrial affairs, and in education has outstripped the practice of the same principle in the church. Of course, personal gain is often the motive of monopoly in business; federal government is to some extent the price of protection as well as one of the moral products of the church; and while division in the church has come through an invaluable social evolution the continuance of this division in the small town is largely the consequence of small intelligence for which the church is not solely responsible.

Before discussing federation as applied in country churches we must be sure of our meanings. The country town is only indirectly concerned with the constitutional uniting of entire denominations. This does not always lessen the number of local churches. In the second place, every community of more than one church ought to practice moral union. They should work together in moral reform, and for social and religious betterment. The most important aspect of federation is that which reduces the number of local churches by the coöperation, amalgamation or organic union of two or more of them. Local church federation at its best is only a means to an end. It should be a transitional process leading to single churches. Experimental federations, though profitable, would be better still if they proceeded directly to affiliation with a single denomination.

We have only just begun to apply the methods of social economy to country church conditions. Some useful conclusions have so soon resulted, however. For instance, we have learned the economic motives for observing the federal principle: (1) The maintenance of separate churches in the same community, unless necessitated by distance or by some absolute social unlikeness, tends toward financial waste. It is unfortunate that in three-fourths of the cases of federation in the country towns it has not come until compelled by economic necessity. A church fails morally, as a rule, when it is consuming unproductive capital. (2) Local sectarianism interferes seriously with the supply and use of the clergy. Ministers will no longer easily consent to work underpaid, to outrival neighboring churches. The scarcity of ministers tends to make such competition impossible. (3) Local sectarianism violates the principle of spiritual service. The local church lives to minister to the whole community, not to pander to a choice constituency. (4) There is an educational advantage with federation. Sectarian phases of truth, as prism colors, are blended into the full white light of the kingdom of God.

On the other hand, there are limitations to the organic application of the federal principles: (1) If federation is utilized primarily in response to economic or popular demands, there is apt to be a lessening of respect for the church and to secure new members for the church becomes difficult. The practice of this principle calls for spiritual as well as for social interest. (2) Transitional federations, where churches for a time have to relate themselves to different denominational organizations, suffer from too much friction. (3) Union, and sometimes federated churches, like other single churches, miss certain advantages of those working side by side. These are the impetus of healthy rivalry, the natural response of different people to particular denominational types, and the power of responsibility through more organization to draw and educate. Church federation, however, in spite of its limitations, points the way of the greatest reform that is needed by the country churches. Intelligent farmers, country educators and business men, as well as the ministers, should inform themselves of the needs and methods of this very work that they may be prepared for the indispensible service of leadership.

The social problem of the rural clergy.

The problem of sectarian division in country towns is hardly more vital than that concerning the rural clergy. The case may be fairly set before us by means of a recent investigation involving 629 country ministers in nine different states outside of New England. The data should be representative, since it comes from states as widely distributed as New York, Ohio, Virginia and Minnesota. The study was made by men who have the country church problem at heart, who have had direct and sympathetic relations with the ministers, and who are trained to speak without bias. The clergymen are reported as being genially disposed, consecrated, faithful, self-sacrificing, educated, and to some extent ambitious, and considered as leaders. In some minor sections none seem to have been to the theological seminary and but few to college, but, as a rule, a majority of at least 60 per cent are both college and seminary men.

From 25 to 75 per cent of the men are cramped and deficient from lack of adequate financial support. A majority of the reports indicate that at least 75 per cent are thus hindered. More than 80 per cent of the ministers seem to place denominational before church or religious interests, more than 70 per cent church interests before those of the community, and a similar majority to put community before larger world interests. With this striking tendency to a limited view-point, we are not surprised to find 90 per cent of 300 of these ministers reported as apparently lacking in personal religious leadership, and a majority of the remaining ministers as thus lacking.

A majority of the rural clergymen—they being so well educated and with so many advantages of service and breadth placed before them—are considered as largely to blame for their own deficiencies. On the whole, an encouraging improvement is observed in the rural clergy in the last ten years. The problem of the rural clergyman seems to be essentially social. He rusts out rather than wears out. He stagnates with his comparative isolation. He is more influenced by his parish than capable of reacting upon his parish. One particular need of the rural clergy is special training for meeting the specific conditions of country life. In too many instances, the rural minister ceases to become the intellectual and personal superior of the average of his parish.

A most encouraging recent development is the addition of courses on rural social and religious problems to the curricula of theological seminaries. In this regard, however, the agricultural college is still the leader of the theological seminary. The problem of the deficiency in numbers of rural ministers will tend to disappear as the agricultural people take interest and pride in their churches as the monitors of their own spiritual welfare, and the ministers, themselves, learn better the lessons of the coöperation of the church with other religious and social enterprises, of local church federation, and of personal breadth and leadership.

The country church and social service.

The country church sometimes fails on the point of social service. This is so even though social service is never the primary function of the church. There are five principles which seem to be observed in the successful social service of the country church. The first is the principle of vitality. By this is not meant that all social work is to serve evangelistic ends, but that the church should, whatever its method, maintain its spiritual integrity. The church fails in reality when it ceases to inspire. The second principle is that of service. The giving church, not the drawing church, grows. Unworthy "commercialism" in the church ceases wherever this principle dominates.

Coöperation is the third social principle. The church should never do what a club could do as well. The country church, especially, must coöperate with the homes that they may be led to perform their own religious and moral functions. The school and the grange are the strongest when they are in the closest social touch with the church. The fourth is the principle of substitution. For the church by "institutional work" to supplement rural society on its domestic, educational, industrial or amusemental sides makes the church a social center, and in so far, a venture toward social solidarity. This is an advantage only as it helps to restore these various agencies. The country church may become a social means, by substitution, but this should be only temporary. The church cannot spiritualize society by yielding spiritual means to social ends, but rather by filling social agencies with spiritual men.

The final social principle is that of unification. We should keep to the few primary institutions rather than multiply those of lesser value. And thus the whole community should become the reciprocal subject of service. Where these principles are maintained and coördinated according to local needs and possibilities, the more social service by the church, the better. These conditions being met, the more spiritual a church is the more social it will become. Edward Everett Hale is right in more than one sense in saying that "any church which does anything is an 'institutional church.'" The active country church today is usually an institutional church, even though its social-service features are neither formal nor expensive. The ladies' aid society, the boys' club, the cradle roll, the church lecture-course, the male quartette, the mission study class, the parish quarterly or monthly bulletin and the church magazine club are common institutional features in country churches.

One typical example of coöperation in religious and social service is in the mountain town of Lincoln, Vermont. Three church societies unite in what is called the Federated Churches. The Ladies' Aid and Good Templar's Hall is virtually the parish house. It serves as the home of the grange, the Good Templar's Lodge, the Grand Army Post, the village library, the church prayer-meetings, and all the social entertainments of the church and community that are consistent with the moral standards of the church. One of the most remarkable instances of direct social service by the church is the New Hampshire Country Settlement Association. It has its Settlement House at Danbury. This institution maintains its religious services, has its district nurse for the care of the sick and needy in the community, and, besides its social- and moral-reform work for the whole state, it does educational and social-betterment work throughout the neighborhood.

Country-church architecture today, by the presence of kitchens, dining-halls, class and social rooms in the church itself, where there is no parish house, which very often have, in addition, the gymnasium, the lecture-hall, the reading and bathrooms, even in country towns, is teaching christian brotherhood as not in the days of the one-roomed church and the prophet-preacher of God, the King.

The practical problems of religion and theology.

Religion and theology cannot be omitted from a discussion of the country-church question. It is not difficult to treat in a strictly practical manner the leading religious and theological problems which arise, for each of these has a social bearing. Even evangelism, the propagandism of the religious aspects of the church, has social conditions that are as fundamental as are the religious conditions. The country church has a social problem concerning evangelism when the revival is used by one church in a community as a means of outdoing another church. The church has a similar problem when the revival is used to take the place of the pastoral function. The community unit is always the social base of the revival, the spiritual regeneration of the social whole, its normal end, and the means, the coördination of the social with the religious conditions.

Emotionalism, that problem which so often arises with misdirected evangelism, is largely occasioned by stress upon the devotional aspects of religion at the expense of social and educational emphasis. This disorder, grounded sometimes in the peculiar makeup of certain individuals, when it cannot be avoided by well-balanced work in the church, may be overcome by enthusiastic missionary enterprise, or else, in chronic cases, some form of asylum or isolation is its only riddance. Sectarian bigotry, a disease so often charged to the presence of dogma and creed, is more often simple adherence to some select social grade or group.

We are not living in a theological age. Religious indifference, the most commonly observed problem of the church, is the failure of religious interest where moral and social strength still persist. This decadence calls for stronger leadership in spiritual work, a revival of the prophetic in preaching, and of direct missionary enterprise by the church. Even the religiously destitute neighborhoods can be made to respond to sufficiently broad, charitable, but genuine, missionary endeavor from nearby churches. The New England problem in its last analysis is theological— not a problem of deficient theology, but of too much of it—speculation at the expense of religious vitality. Theological thought is productive of good character only in soil that is watered by personal service and religious devotion.

The practical solution of country-church problems.

The practical solution of the existing spiritual problems of rural society is the vital point. Though some have lost faith in the country church, in its stress of adjustment to our dawning social age, and which too often has become the enslaved subject of the unworthy, nevertheless the country church is monitor, as it always has been, of the moral and religious strength and growth in rural life. When the true place and worth of the country church becomes recognized, the agricultural people will be reminded through the agricultural colleges, in the granges and farmers institutes, and by the agricultural press, of their delinquency, or at least, of their own privileges and duties.

According to the present temper of society, every force which proposes to uplift mankind organizes itself. Thus, in the solution of the country-church problem, we must look to the organized agencies. In this regard, much is to be expected from the increased instruction in the principles and needs of rural life at the agricultural and theological schools. Organized evangelism is a force of leading promise. The renewed impetus of the Sunday-school movement and the reënforced work of home missions are most encouraging. The National Federation of Churches stands at the head of the leading spirit of the age. Coöperation between the school, the grange and the church is coming to be a most effective coincident of social organization.

But there is one movement that is a leader in the religious and moral betterment, especially of the country life of America. This is the County Department of the Young Men's Christian Association. The work of the County Department is important because it touches so many points of actual need and because its principles are fundamental. This department was founded by Mr. Robert Weidensall in 1889. The occasion of its formal beginning was the employment of the first county secretary for Edgefield county, South Carolina. The work of this department of the general Young Men's Christian Association movement is now established in twenty states and provinces, fourteen of which employ secretaries for supervision. There are thirty-nine organized counties, thirty-seven of which employ secretaries. The county work, through its secretary, often reaches churchless communities to inspire and uplift its boys and young men, but where country churches exist they are always used as the center and the basis of the work.

This department, supplementary to the church, supplies the greatest spiritual need of the average rural town—religious vitality. The country minister is brought into active touch with the environment that strengthens him at the strategic point of leadership with the country boys and men. Men, not material equipments, are brought to supply the personal needs of men. Personal strength at work in personal religious service is the keynote of the movement. The principle of balance is well observed. Not only is the work interdenominational, but its physical, social and educational phases are not neglected. The extensive statistical work of the movement, though practical first of all, is of leading scientific value. Of the nearly five thousand men enrolled in Bible study the past year, 700 adopted the religious life. This movement under its national and state supervision is capable of organizing within a few years sixteen hundred counties in the United States.

Literature.

There is no very satisfactory literature as yet upon the country church and its practical problems. The statistics gathered by Bible societies, Sunday-school associations, the denominations for their year-books, and by the county department of the Young Men's Christian Associations, are to form the basis for useful conclusions as soon as they may be given scientific treatment Nevertheless, many phases of the rural church question have been worked out in reports, printed addresses and magazine articles of value. Omitting notice of writings of general church interest, a few of the leading articles on the country town and church will be given: Wilbert L. Anderson, The Country Town (New York, 1906); Alfred Williams Anthony, The Problem of the New England Country Church (Homiletic Review, July, 1899); James E. Boyle, The Passing of the Country Church (The Outlook, March 28, 1904); Kenyon L. Butterfield, Chapters in Rural Progress (Chicago, 1907); Samuel W. Dike, The Religious Problem of the Country Town (Andover Review, August, 1884; January, June and September, 1885); Daniel Dorchester, The Religious Situation in New England (Methodist Review, November, 1894); W. Stanley Emery, Five Years of Country Settlement Work (Pamphlet, Tilton, N. H., 1905); Henry Fairbanks, The Needs of the Rural Districts (Address delivered before the Boston Conference of the Christian Alliance, December 4, 1889; pamphlet); Henry Fairbanks, The Problem of the Evangelization of Vermont (Minutes of the Ninety-first Annual Meeting of the Congregational Ministers and Churches of Vermont; pamphlet; Montpelier, Vt., 1887); Rollin Lynde Hartt, A New England Hill Town (Atlantic Monthly, Vol. LXXXIII, pages 561 and 712, 1899); Rollin Lynde Hartt, The Regeneration of Rural New England (The Outlook, March 3, 10, 17, 31, 1906); Charles E. Hayward, Institutional Work for the Country Church (Burlington, Vt., 1900); Charles Richardson Henderson, Social Duties in Rural Communities (Biblical World, September, 1907); Henry L. Hutchins, Rural Town Decadence in Connecticut (Address delivered before the New Haven Ministers' Meeting, February 23, 1903; pamphlet); William DeWitt Hyde, Church Union a Necessity (Forum, April, 1893); Impending Paganism in New England (Forum, June, 1892); and, The Transformation of New England: Is It Decay or Development? (Forum, March, 1893); Albert J. Kennedy, Religious Overlapping (Independent, April 9 and May 7, 1908); G. T. Nesmith, The Rural Church (American Journal of Sociology, May, 1903); William C. Prime, Country Churches in New England (Princeton Review, September, 1886); Graham Taylor, The Church as a Center in Rural Organization (Proceedings of the Michigan Political Science Association, 1902); Nathan A. Weeks, The Regeneration of Rural Iowa (The Outlook, June 2, 1900); George Frederick Wells, An answer to the New England Country Church Question (Bibliotheca Sacra, April, 1907); Church Federation in Vermont (First Annual Report of the Executive Committee of the Inter-Church Conference on Federation, New York, January 1, 1907); The Country Church and Its Social Problem (The Outlook, August 18, 1906); The Country Church and the Making of Manhood (Homiletic Review, August, 1907); What the Country Churches Need (Methodist Review, July, 1907); G. Frederick Wright, The Country Church (Bibliothera Sacra, April, 1890).

COÖPERATIVE FIRE INSURANCE AND TELEPHONES

By *Fred W. Card*

Farm buildings are peculiarly liable to damage from fire. Lightning and lanterns are responsible for a large percentage of this loss. The severe summer thunder showers that frequently occur when barns are filled with heated hay and grain are responsible for many fires at that season of the year. As winter approaches, with its shortened daylight hours, lanterns must be brought into use in the night and early morning. Accidents with these are inevitable, and inflammable material is ready at hand when they do occur. Furthermore, few facilities for fighting fire are to be found on most farms.

Mutual fire insurance companies.

These conditions, with their consequent losses, have led the old-line insurance companies to discriminate against farm property; rates have been advanced or risks entirely refused. As a result of this, mutual companies have gained much headway in farming communities. In Iowa alone, there are 153 county mutual companies, and sixteen state mutual companies reported for the year 1906. When properly managed, these companies have given excellent satisfaction, providing insurance at considerably less expense than the old-line companies and affording a greater feeling of security to their members. Being managed by farmers and neighbors, the party insured feels that there is less likelihood of attempts to avoid payment being made in case of loss.

During the ten years previous to 1906, the risks in force by mutual companies in the state of Iowa have shown a steady growth from $190,466,908.61 in 1897 to $457,407,488 in 1906. The risks written during that year represented more than one-fifth of the entire insurance business of the state. In Pennsylvania, the mean amount in force in 1906 was $934,552,808, and the losses paid amounted to $2,017,686.99. Pennsylvania now has about 260 associations, Wisconsin, Iowa and Illinois about 230 each, Minnesota about 160, New York and Ohio each about 125, and other states have less numbers.

Organization of mutual companies.

Two methods of organization are in vogue. One of these is patterned after those of the old-line companies, a fixed premium being charged all who insure, the purpose being to accumulate a surplus from which losses may be paid. In case the amount so secured is not sufficient to cover losses, assessments are made upon the parties insured.

In the other method, no premium is charged, the only fixed charge being one made for the policy at time of insurance, which is designed to cover the cost of examining the property and passing upon its valuation by a member of the board of directors.

Two companies will serve to illustrate these two methods. The Patrons' Fire Relief Association of Rhode Island is organized upon the first plan. Its officers consist of the usual president, secretary, treasurer, and a board of directors, having the customary powers delegated to such officers. Insurance is accepted from members of the Grange only. Insurable property is divided into two classes. "Class No. 1 includes dwelling-houses, barns, or other buildings, with their contents, when no other dwelling-house is situated within one hundred feet, and no other building within fifty feet of same. Class No. 2 includes the same kind of property where no dwelling-house or other building is situated nearer than thirty-five feet from same; also buildings occupied by tenants." The rates charged upon dwellings are ¾ per cent for the term of three years in Class No. 1 and 1 per cent in Class No. 2. Upon barns and adjacent buildings the rates are ¼ per cent higher. The by-laws provide for the manner of making assessments and adjusting losses. No policy is issued for more than $3,000, but separate policies may be issued to the same party in case of separate or detached buildings.

This company began doing business in 1901 and was closely patterened after others that have been longer in existence. It was fortunate in having no large losses to pay in the beginning, consequently was not obliged to resort to assessments to meet its expenses. The rates charged are materially less than those in force by the old-line companies for the state mentioned. The financial statement at the close of business, 1906, showed a cash balance on hand of $2464.33. Under ordinary conditions, this balance would materially increase during 1907 as a large amount of insurance would expire during that year, being six years from the time business began.

The Grange Fire Insurance Company, of Troy, Pennsylvania, is a typical company of the other class. This company was incorporated March 26, 1877. It insures property only within specified portions of Bradford and Tioga counties, and only in case such property is owned by members of the Grange. Any such person may insure property within the area specified by paying a fee of two dollars and fifty cents and five cents for each one hundred dollars of insurance covered by the policy. In case of revision the charge is one dollar, plus five cents per hundred dollars of increase over the previous policy if such increase shall occur. The company insures property for only two-thirds of its cash value and will not accept more than $3,500 in one risk. Buildings within eighty feet of each other are considered as being within one risk. The principal provisions of the policy are those provided for by the state law. The by-laws cover details regarding the character of the risks accepted, precautions to be taken in the use of steam and gasolene engines, the duties of officers, manner of making assessments and the like. This company has provided a very satisfactory insurance to its patrons at moderate cost. At the present time it has over 1,800 policies in force, representing risks aggregating about $3,150,000. Assessments are usually made at a two-mill rate, the amount so secured being sufficient to cover several losses. The plan has much to recommend it and is free from some objections to which the other is subject.

Fig. 79. An insurance office in a farmhouse.

These companies are merely typical of those in operation in very many parts of the country. Coöperative companies, well managed, are very satisfactory forms of insurance on country property at the present time.

COÖPERATIVE TELEPHONES.

But a few years ago the telephone was only for the business man. Its cost was prohibitive to the farmer. No line passed his door, or if one did the rental fee would have been so great as to make its use unprofitable for him. But as the importance of the telephone came to be better appreciated the farmer began to investigate. He learned that the cost of the telephones themselves was not great and that the construction of the line was not such a difficult and mysterious operation as he had supposed. A few men joined together to connect their farms or places of business. Soon others wished to unite with them, and so the undertaking grew. The development of independent farmers' lines has been almost marvelous. A system started as a small neighborhood affair would spread and grow, taking in more and more farms, touching more and more towns, bringing in business men and physicians, establishing exchanges and covering county after county with its wires.

Growth of independent lines.

The growth of independent lines has been so rapid that available statistics are of little value. According to the census report, there were 4,151 telephone systems, with 4,850,486 miles of wire in operation in the United States in 1902, not including the independent rural lines of a purely coöperative nature. At that time, the Bell lines operated 3,387,924 miles of wire with 1,222,327 subscribers and the independent lines 1,462,562 miles of wire with 956,039 subscribers. Of these independent lines, those classified as commercial carried 121,905 telephones, those classed as mutual 89,316 and those as independent rural 55,747. Under the latter head were included those lines having no regular exchange or central office.

During the nine years from 1894 to 1902, inclusive, 3,039 independent commercial systems were established. Between the years 1881 and 1895, inclusive, only 37 mutual systems were established. The great increase in this class began about with the beginning of the present century, 269 mutual systems being established in 1901, and 295 in 1902. There were established during the year 1902 alone 823 independent commercial and mutual systems in the United States. These figures serve to show something of the progress being made by this class of telephone service.

Fig. 80. A farm home telephone.

For years the Bell Telephone Company refused to connect with the independent lines. This only added to their growth, so that a telephone on an independent line might become more valuable than one on the Bell lines, because the former would probably reach fifty farmers where the the other might not reach five. Farmers' lines now hold an important place in the life of almost every community. They mean much to the business of the farm, and perhaps even more to the life of the farm home.

Value of mutual lines.

No one feature of modern life has done more to compensate for the isolation of the farm than the telephone. The rural mutual lines have brought the farmers' wives in touch with each other as never before. While it is true that the visiting thus made possible sometimes interferes with the usefulness of the lines for business purposes, the telephone proves a boon to the farm household in trivial matters as well as those of greater moment.

Organization of a mutual company.

A detailed description of two farmers' lines will serve to illustrate the methods in vogue.

(1) The Farmers' Telephone Company operating in the vicinity of Canastota, N. Y., was organized in 1900, and incorporated as a stock company. The par value of shares was fixed at twenty-five dollars. The money received from the sale of shares was used to build the line. Every patron buys his own instrument, the company merely insisting that all telephones shall have the same ringer resistance. The farmers did the work of building the line and soon learned to install the telephones themselves. An arrangement was made with a store-keeper in the town to install a small switchboard, and the line grew; within a year fifty telephones were in use. The operating expenses are paid by an assessment levied at the annual meeting, the expenses of the year being grouped and adjusted. At the end of six years, the assessments had aggregated $21.58 per instrument, an average of $3.58 per year.

At the end of three years, the representatives of the Bell lines awoke to the situation and offered to take these lines into their central. Under this arrangement the patrons of the farmers' line are given switching service to all the telephones in Canastota, some 300 in number, at an additional cost of two dollars annually, for the rent of a Bell transmitter and receiver. This arrangement has proved satisfactory. The line has steadily grown, and would have grown much more rapidly if the farmers could have found time to build the lines. The farmers soon learned to splice a broken wire, put in fuse wires, install telephones, and to do similar work. Only rarely has it been necessary to call in a professional workman.

(2) The Citizens' Mutual Telephone and Telegraph Company, operating in the counties of Tioga, Bradford, Potter and Lycoming, in northern Pennsylvania, affords another illustration of the success that may be attained by farmers' lines. Its methods are similar to those of the company described above. The company was incorporated in 1901. Its annual report for the year ending June 30, 1907, shows 1,214 subscribers and 760 miles of wire, with fourteen exchanges. Its connections with other independent companies, both in New York and Pennsylvania, enable subscribers to reach almost any point desired, including Elmira, Buffalo, Binghamton, Rochester, Syracuse, Wilkes-Barre and Scranton.

The by-laws of the company provide that any person who shall have paid one dollar to the company and ten dollars toward the construction of the line, in accordance with the rules of the company, shall be a stockholder, and entitled to use any public telephone on the line, but subject to the same assessment as those owning telephones. The payment of two dollars to the company and twenty dollars in the construction of the line shall entitle the stockholder to install a telephone in his residence or place of business. All telephones are owned and installed by the users. No stockholder is allowed to own more than six shares of stock.

The rates charged at the present time are three dollars per year for stockholders and six dollars per year for renters. The subscribers include ministers, doctors, lawyers, banking houses, freight stations, business men, and the like. The farmer can reach almost any business place in his vicinity.

The by-laws and rules provide for the conduct of the business, the character of the line, the instruments to be used, and similar details. The large number of telephones in use affords excellent service to all.

TRAVELING LIBRARIES

By *Lutie E. Stearns*

One of the agencies which is doing a great work in removing the old-time feeling of isolation on the farm, and which may be properly classed with good roads, trolley lines, rural free delivery and farmers' telephones, is the modern traveling library. Traveling libraries are collections of twenty-five to one hundred volumes which are sent out from some central repository and exchanged at frequent intervals.

Origin and growth.

Melvil Dewey, formerly State Librarian of New York, was the first library worker to appreciate the needs of rural communities that are too small to support public libraries and that would otherwise be deprived of library privileges. In 1892, Mr. Dewey secured an appropriation from the legislature to inaugurate a new system of library extension, which proved so simple, practical and economical that it was immediately successful and has since been followed in two-thirds of the states of the Union.

With the money first appropriated, Mr. Dewey bought a number of small libraries of one hundred volumes each. These collections were located in villages, hamlets, schools, and in connection with University Extension centers and study clubs. A library was sent to a station to remain for six months, then to be returned to Albany to be sent elsewhere, another library being sent to the original station in its place.

The success of the system in New York prompted the State Librarian of Michigan to ask for an appropriation for a similar purpose, which was granted in 1895, as was one for Ohio as well. Other states took up the work, either through state grants or with the aid of woman's clubs, and in May, 1899, there were 2,500 traveling libraries containing about 115,000 volumes being issued in thirty states. In May, 1908, there are over 5,000 traveling libraries in nearly every state and territory in the Union, twenty-two states reporting a circulation of 600,443 during the year 1907. Of all the States in the Union which reported on traveling libraries in 1907, Wisconsin stood first with a circulation of 122,093.

Benefits of traveling libraries.

Through traveling libraries, the best of modern thought is brought to the door of the isolated home, to comfort, inform, inspire and refresh the tired reader. The feeling, ofttimes expressed, that "Country life is so barren," is removed through contact with the "wisest and wittiest" of all the ages. The books of history make real the great lessons of the past; the books of travel bring Japan, Egypt, and Russia to the family hearthstone; the books of sociology make plain present-day problems and afford subjects for discussion; the books of biography contain inspiring examples of noble manhood and womanhood; the books of science reveal nature's wonders and turn the commonplace into the marvelous; the books of useful arts suggest employment for idle hours; the books of fine arts cultivate the love for the beautiful; while the books of fiction take one out of the realm of everyday drudgery into the great world of make-believe.

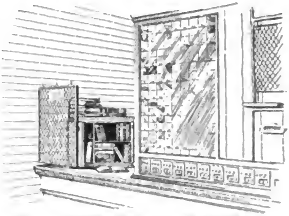


Fig. 81. A traveling library in a country postoffice.

It has been well said that, "It is not possible to devise any extension of our system of popular education which will give so much information, so carefully chosen, so accessible, at so small a cost, as may be gained by adding free traveling libraries. Not one citizen in one thousand could select as good books nor purchase as cheaply, and none could make exchanges of reading as wisely and satisfactorily as all, working unitedly, may do for all."

State systems.

Traveling libraries may be secured by citizens of the following states, upon application to the State Library Commissions at the respective capitals:

California, Colorado, Delaware, Indiana, Iowa, Kansas, Maryland, Michigan, Minnesota, Missouri, Nebraska, New Jersey, New York, North Dakota, Ohio, Oregon, Pennsylvania, Vermont, Washington, Wisconsin.

Traveling libraries in Wisconsin.

Wisconsin was the third state to adopt this method for bringing wholesome books to people in the country. At the present time the Wisconsin Free Library Commission has charge of 563 of these little libraries, the books reaching more than 62,000 people in the isolated districts of the state.

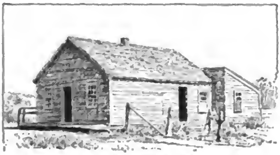


Fig. 82. One type of traveling library station. A rural home.

The beginning of the work in this state is most interesting, the example being imitated in many states. Mr. F. A. Hutchins, Secretary of the Library Commission in 1896, interested the Hon. J. H. Stout, of Menomonie, a wealthy lumberman, in the idea of establishing a system of traveling libraries for the people of Mr. Stout's home county. Five hundred books were purchased at the expense of Mr. Stout, and were separated into sixteen libraries and sent out to the rural districts. The collections proved so popular that the original number of libraries was increased to thirty-seven, which are now circulated and read with interest by the farming communities of Dunn county.

Thousands of copies of unbound monthly and weekly magazines and the leading children's periodicals are sent out with the libraries, and are often read even more than the books. Copies of Farmers' Institute Bulletins and of the reports of the various state and agricultural societies, and many of the more popular volumes and pamphlets issued by the Agricultural Department of Washington, are sent directly to the local library associations, and are owned by them. Before a library is sent to a community, Mr. Stout requires that a small Library Association shall be organized, thus bringing the farmers together. Reading circles and literary societies have been the outgrowth of these associations. Of the thirty-seven stations in Dunn county, twenty-five are in farmhouses, nine in postoffices, two in country stores and one in a railway station. The proportion of libraries in postoffices was far larger before the establishment of rural free delivery.

The experiment of Mr. Stout has been followed in all parts of the United States by individuals, women's clubs and various philanthropical organizations. A wealthy citizen of Chicago established a similar system for large districts in Arizona, while a similar system has since been established in New Zealand. Women in Salt Lake City send volumes regularly to remote families in the valleys of Utah. Mrs. Eugene V. Heard, of Middleton, Georgia, with the aid of Andrew Carnegie and the Seaboard Air Line, has established stations in five southern states. The Kentucky Federation of Women's Clubs has sent out many books to the mountain districts, while the colored graduates of Hampton Institute carry libraries to the schools for their people, at the base of the Cumberland mountains. In Idaho the miners are supplied with books through the efforts of women's clubs, and the people of British Columbia are successful in imitating their American cousins in this work. In Massachusetts, where every community has its public library, the Woman's Educational Association is doing helpful work in using traveling libraries to strengthen the weak public libraries in the mill towns. As some one has said, "The blessings resulting from the use of the traveling libraries have been so great and the expenses so small, comparatively, that the movement has won many friends. A wonderful enthusiasm for the work has seemed to kindle at a touch, and the pioneers have often been overwhelmed with calls for advice and information by those desirous of establishing similar systems."

A sample traveling library.

Traveling libraries should contain books that interest the people whom they are intended to benefit. Collections made up of gifts from private libraries have rarely been permanently successful. As a library worker has said, "The people who have tried to lay up treasures in heaven by contributing books to traveling libraries have often injured a most worthy cause." In these days of rural free delivery when so many farmers are taking daily papers and magazines containing book reviews, it is most necessary to have the volumes purchased for traveling libraries strictly up-to-date to win attention. A sample traveling library recently sent out by the Wisconsin Commission is as follows:

Adams' Harper's Outdoor Books for Boys; Jane Addams' Newer Ideals of Peace; Aëro Club's Navigating the Air; Benson's Thread of Gold; Berry's Fruit Recipes; Bower's Chip of the Flying "U"; Burnett's The Shuttle; Burroughs' Camping and Tramping with Roosevelt; Butler's Pigs is Pigs; Butterfield's Chapters in Rural Progress; Caffin's Story of American Painting; Case's Wisconsin; Cody's Success in Letter Writing; Commons' Races and Immigrants in America; Dahlinger's Where the Red Volleys Poured; DeMorgan's Joseph Vance; Dodd's Helpful Farmhouse; Dudley's With Mask and Mitt; Finley's American Birds; Frenssen's Three Comrades; Given's Making a News-

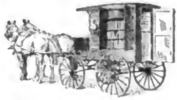


Fig. 83. The traveling library wagon.

paper; Grenfell's Off the Rocks; Hall's Aunt Jane; Hobson's Canada of Today; Houston's Wonder Book on Earthquakes and Volcanoes; Howden's Boys' Book of Locomotives; Hume's Through Portugal; Lang's Pretty Goldy-Locks; Laughlin's Felicity; Locke's Beloved Vagabond; Mabie's Famous Stories Every Child Should Know; McPherson's Working of the Railroads; Morris' Heroes of the Navy in America; Pyle's Stolen Treasure; Root's Citizen's Part in the Government; St. Nicholas—two bound volumes; Shelton's Seasons in a Flower Garden; Schultz's My Life as an Indian; Scott's Kenilworth; Stewart's Partners of Providence; Tarbell's He Knew Lincoln; Tomlinson's Campfires of Mad Anthony; Wallace's Long Labrador Trail; Webster's Jerry Junior; Wells' Future in America; Wharton's Fruit of the Tree; Whitney's Bedtime Book; Wiggin's Old Peabody Pew; Woodbury's Ralph Waldo Emerson.

Traveling libraries and the rural schools.

The traveling library may be made a valuable adjunct to the rural school, supplementing the work in geography, history, science and other subjects. Stories are often used for "morning exercises," and parts of other books are read to excite the interest and desire of the pupils to read them for themselves. In one country district where a library was located in a house adjoining the school, the children were gathered under the trees at noontime by one of the older pupils who read many books aloud to them, "The Masterpieces of British Literature" being a prime favorite among the school children. Traveling libraries are not usually placed in school-houses owing to reasons given elsewhere, but the fullest use should be made of the collection on the part of the teacher and school children.

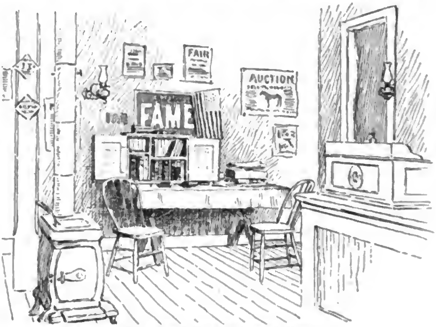


Fig. 84. Library station in a country store.

Libraries and farmers' clubs.

The books in traveling libraries are ofttimes used by local literary associations. The songs in a book of "Popular Melodies" make fitting introduction, for example, to an evening's entertainment; while extracts from Mrs. Wiggin's "Birds' Christmas Carol," Mrs. Rice's "Mrs. Wiggs of the Cabbage Patch," or Ellis Parker Butler's "Pigs is Pigs," will afford much wholesome amusement. Such books as Brookings and Ringwalt's "Briefs for Debate" contain valuable material for discussions, while Tennyson's and Longfellow's poems and other classics in literature offer inspiration to the members.

Many State Library Commissions are sending out traveling libraries composed wholly of study material on various subjects, such as Good Roads, Forestry, American and English Literature, French History and other topics, which form the basis, with study outlines also furnished, for years of earnest study.

Rural free delivery of books to farmers.

Traveling libraries have their limitations. They must cater to the wants of the many with their miscellaneous collections, thus neglecting the would-be scholar whose interest centers on a particular line of study. Unless traveling libraries are reinforced frequently by new books, but little opportunity is given rural readers to learn of new discoveries in science or of the world's progress. A community, for example, that is in a circuit of thirty boxes exchanged every six months would be fifteen years behind the times in the world of history, were not constant additions made of volumes pertaining to current topics.

With the establishment of the "parcels post" will come the inauguration of public-library-to-house delivery of books, enabling farmers to secure individual volumes on topics of the day. Through this method, if established, an inquirer would not need to wait more than twenty-four hours for the receipt of the latest works on the world's advancement. Librarians that have the welfare of farming communities at heart are working hard for the establishment of the "parcels post," that the usefulness of their respective libraries may be thus increased.

A book wagon for farming communities.

To Miss Mary L. Titcomb, librarian of the Washington County Library at Hagerstown, Maryland, belongs the credit and honor of the establishment of the first book wagon for the distribution of books to rural communities. The library at Hagerstown, Maryland is fortunate in being free to the people of the entire county. A system of traveling libraries is maintained, but this has been found insufficient for the needs of the isolated districts, and a book wagon containing a goodly supply of wholesome literature is sent out at frequent intervals.

The cost of the wagon was $175. It was designed to carry several of the traveling library cases, with shelving, having a capacity for about three hundred volumes, on each side, the doors opening outward. In the course of the journey, the cases are delivered by the library janitor at their proper stations, others picked up to be brought in for exchange, and all of the out-of-the-way farmhouses on the route visited, where an invitation is given for the family to come out and inspect the wares offered, the wagon being driven through the country lanes directly to the door. Books are left for two months with the understanding that neighbors may exchange among each other, and at the end of the time the wagon goes back with another set. Thousands of books have been issued through this method, the experiment proving most successful and in every way worthy of imitation in other states.

Location of traveling libraries.

Libraries in country communities should be in rural postoffices, general stores or in homes to which people feel free to go. It is not well to place them in schoolhouses if other locations can be secured, as these buildings are closed during long vacations, thus rendering the library inaccessible.

Charging systems.

The charging system should be as simple as possible, as the service rendered is usually volunteer labor on the part of librarians. The system in vogue among public libraries, of book pockets, book cards, and borrower's card will be found most satisfactory.

Exchange of libraries.

The library should be returned to a central point at regular intervals, and should not be allowed to be left until interest in the collection has waned. The books should not be sent from one station to another, as losses cannot be accounted for nor books repaired and bound, under such circumstances; but they should be returned each time to some central library for checking and repairing.

Shipping the libraries.

A number of methods have been tried, such as strongly made cases, which serve as packing-boxes, and also as book-cases when they reach the library stations. Such cases are usually crated and are accompanied by keys. Locks and padlocks have not been found satisfactory when the boxes are sent by freight; and the best method of shipping has proved to be strong packing-cases, the covers screwed down. A chest, 23 x 18 x 16 inches will hold fifty volumes, together with a few magazines.

Fees and charges.

In some states a regular fee is charged for each shipment, the freight being thus paid in advance, while in other states no advance charge is made, the association paying for the box upon receipt and return. Some states charge no fee whatsoever. Unless the latter plan is adopted, judgment should be used ofttimes in collecting fees, as some communities, isolated from the library repository, will be found too poor to bear the necessary expense to secure the collection, while needing it more than the well-to-do.

Traveling Pictures

The traveling picture movement was suggested through knowledge of the benefits derived from traveling libraries. To many, pictures are a more potent influence than books; and the cultural and pleasure-giving elements cannot be overestimated. The pictures chosen for traveling collections are various in kind, comprising landscapes, marine views, religious subjects, architectual masterpieces, and those possessing "heart" interest, such as Hovenden's "Breaking Home Ties," Israel's "Alone," and kindred works. These are mounted on cardboard which is cut to form a mat. When deemed worthy, the picture is framed, but without glass—the latter being omitted for convenience in shipping. On the back of the picture is placed a short description of it and a sketch of the life of the artist. A tape with a brass ring is attached for hanging and a stout manilla envelope protects the whole. The pictures are numbered and issued in a manner similar to the issuance of traveling library books.

In Dunn county, Wisconsin, hundreds of large, framed photographic reproductions of famous paintings are being circulated in the homes through the medium of the school-houses. When all of the pictures have been hung in the school and homes of one district, an exchange is made with another section of the county.

In this manner the otherwise bare walls of many homes are brightened and the occupants cheered by the presence of Raphael's "Sistine Madonna," Breton's "Hark, the Lark," Millet's "The Angelus," and other artists' masterpieces. The love of pictures is innate in all people, it is said, and if gratified and cultivated may be made a means for moral and intellectual training. There are many people too busy or indolent to read who may be so attracted and stimulated by constant companionship with beautiful pictures as to care to read that they may know more regarding them and the world at large.

Stereoscopic views with explanatory text, together with lanterns and slides, are also circulated.

[The reader should also consult the article on Reading Courses in Chapter VIII.]

LEAGUES FOR RURAL PROGRESS

By *Kenyon L. Butterfield*

"Education" and "coöperation" are the watchwords of the twentieth century rural betterment. Our educational propaganda is well under way, although we perceive but dimly the full fruition of the ideas which are now dominating. In coöperation, however, we have hardly begun to understand the problem. Farmers, for forty years, have maintained some kind of organization. Associations of various types have multiplied exceedingly, and business coöperation has increased gradually. But while the methods of coöperation have not been worked out, the idea that the coöperation of individual farmers is absolutely essential to the welfare of the rural people, is becoming thoroughly established.

Another phase of the idea of coöperation, just as significant as the idea of coöperation between individuals, has recently been promulgated, although the machinery for developing the idea is thus far incomplete and inadequate. The writer refers to coöperation among organizations, agencies, or institutions. The great difficulty with the proper development of coöperative efforts is that there are so many lines of activity, so many rural interests, that each association, organization, or institution is inclined to narrow its work. Indeed, efficiency can be secured only in this way. But if the rural problem, as a unit, is not recognized, and the relationship of each individual, and particularly of each organization, to the whole problem is not understood, there cannot possibly be the most intelligent direction given to the various types of coöperation among individuals.

To remedy this defect, there has been proposed, and in some cases worked out, the idea of a federation, conference, or league for rural progress. The purpose is to bring together, in various ways, representatives of all organizations, clubs, associations, institutions, or even individuals, having an interest in any phase whatever of agriculture and rural life—technical, economic, social, political, moral or religious. The object is to show by this union of interests the unity of the whole problem, and the relation of each factor to the problem. In this way it is thought that each association can understand its own work better, because it can study it with reference to the work of other organizations and institutions. In the long run, it is quite probable that duplication of effort may be avoided. It is also believed that, eventually, under some auspices or other, a great clearing-house may be established for the study of the rural problem in all its phases, and the dissemination of the results of that study.

Efforts at coöperation of rural social forces.

The efforts thus far made to realize the idea of coöperation of rural social forces may be listed somewhat as follows:

The first effort, on a large scale, was a joint meeting of the Michigan Political Science Association and the Agricultural College and Farmers' Institutes, at the Michigan Agricultural College, in February, 1902. At this meeting, the kernel idea was first promulgated, and the program was based entirely on this theory. The addresses were printed in the Bulletin of the Michigan Farmers' Institutes for 1901–02, and also in the regular publication of the Michigan Political Science Association, with the title, "Social Problems of the Farmer."

Rhode Island has a State League for Rural Progress, which grew out of a Conference on Rural Progress, held at the Agricultural College at Kingston early in 1904. Annual meetings have since been held, as well as other local meetings. The League is organized on a definite basis, with membership from all of the state organizations interested in country life.

A local effort of large interest was the organization, in 1904, of the McHenry County (Illinois) Federation of Rural Forces.

The Massachusetts Agricultural College, as a means of celebrating the fortieth anniversary of its opening, October 2, 1907, held a Conference on Rural Progress, made up after the same fashion as those already indicated. A permanent organization has not yet been formed, but the fundamental idea of attempting to secure coöperation of rural social agencies was brought clearly before the meeting.

In the spring of 1907, there was held in Boston the first New England Conference on Rural Progress. An attempt was made to discover the opinions of the leaders of the agricultural movement in New England as to the value of this idea of better coöperation, and the practicability of accomplishing it.

Under the direction of that conference, a second conference was held in March, 1908, and a permanent organization formed. The constitution of this conference, together with a list of the institutions, associations and agencies voted into membership, indicates the fundamental character of the idea of the coöperation of institutions, and the scope of its possible endeavors. This constitution, and the list of agencies voted into membership, are given below for their suggestive value.

CONSTITUTION OF THE NEW ENGLAND CONFERENCE ON RURAL PROGRESS

Article I. Name

The name of this organization shall be "The New England Conference on Rural Progress."

Article II. Object

The object of the Conference is to promote the interests of agriculture and rural life in the New England states by securing the coöperation and federation of the various state and inter-state organizations and agencies which are working for rural betterment and agricultural advancement in New England.

Article III. Membership

Any state or inter-state organization in New England interested in agricultural and rural advancement may, on the approval of the executive committee, be represented in the Conference by its appointed delegates, without restriction as to number. Each organization thus represented shall have one vote.

Article IV. Officers

The officers of the Conference shall be a President, a Vice-President, and a Secretary-Treasurer. The terms of these shall be for one year.

These officers and four others, to be elected by the Conference, shall constitute an Executive Committee. One member of the Executive Committee shall be chosen each year and serve for four years. Officers and members of the Executive Committee shall serve until their successors are elected.

Article V. Meetings

The Conference shall meet annually, in Boston, during the first week in March, unless some other time and place are ordered by the Executive Committee.

Article VI. Amendments

This constitution may be amended at any meeting by a two-thirds vote.

ORGANIZATIONS ELECTED TO MEMBERSHIP IN THE NEW ENGLAND CONFERENCE ON RURAL PROGRESS

New England School Superintendents' Association.

New England Federation of Agricultural Students.

Maine.—State Board of Agriculture, Superintendent of Public Instruction, University, Agricultural Experiment Station, State Grange, Inter-denominational Commission, Foresters' Association, Maine State Pomological Society, Maine State Poultry Association, Maine Dairymen's Association.

New Hampshire.—State Board of Agriculture, Department of Public Instruction, Agricultural College, Experiment Station, State Librarian, State Grange, Foresters' Association, Inter-denominational Commission, State Dairymen's Association, State Horticultural Society.

Vermont.—State Board of Agriculture, Department of Public Instruction, University, Experiment Station, State Grange, Federation of Churches, State Foresters' Association, State Maple Sugar Makers' Association, State Horticultural Society, Vermont Dairymen's Association, Vermont State Fair.

Massachusetts.—State Board of Agriculture, Board of Education, Agricultural College, Experiment Station, State Librarian, State Grange, State Federation of Churches, Massachusetts Horticultural Society, Massachusetts Society for Promotion of Agriculture, Massachusetts Cattle Owners' Association, Massachusetts Creamery Association, Massachusetts Forestry Association, Massachusetts Fruit Growers' Association, Massachusetts Civic League, Massachusetts Bee-Keepers' Association, Massachusetts Commission on Industrial Education.

Connecticut.—State Board of Agriculture, State Board of Education, Agricultural College, Experiment Stations, State Librarian, State Grange, Federation of Churches, Connecticut Dairymens' Association, Connecticut Pomological Society, Foresters' Association, Poultry Association, Plant Breeders' Association, Sheep Breeders' Association.

Rhode Island.—State Board of Agriculture, Commissioner of Education, Agricultural College, Experiment Station, State Librarian, State Grange, Rhode Island League for Rural Progress, State Federation of Churches, State Association of School Superintendents, State League of Improvement Societies, Rhode Island Horticultural Society, Rhode Island Poultry Association, Foresters' Association.

Need for a national league for rural progress.

The National Farmers' Congress has a committee charged with determining the feasibility of federating the agricultural organizations, in connection with the Farmers' Congress. In pursuing its investigations, the committee discovered that, in several states, such federation had been made under some auspices or another. In the federations thus achieved, the principal object seems to be that of bringing together the various state organizations, for the purpose of securing greater influence in legislation which concerns the industry of agriculture. It certainly would seem extremely desirable that such federation should be accomplished in every state, even if it does not seem practicable to organize on a national scale. The sense of unity that would be developed among farmers would, alone, be worth the effort to federate in this fashion. This type of federation is not quite the same as that which endeavors to unite all rural institutions, the latter being the more indefinite but broader work.

All this work is so new that it has not yet proved its usefulness on a large scale, although it is only fair to say that those persons who have watched the various enterprises just described have come to believe fully in the fundamental idea underlying the projects.

The necessity of studying the economic and social aspects of country life, as well as the technical and business phases of agriculture, is now pretty well recognized. The coördinate need of a propaganda on behalf of these higher reaches of the agricultural problem would seem to be equally patent. There is no reason for doubt that, if work of this type could be thoroughly organized, so that there could be annual, and possibly even more frequent conferences on rural progress in all of the different counties of the United States, with annual state conferences in each state, and finally a splendid national conference each year, the work of rural betterment would be forwarded immensely. The country needs community ideals. We need to see the whole problem, and the relation of each part to the whole. We need to look at the rural question as a significant national affair, concerning not only the country people themselves, but our whole American civilization. There is room for an "American League for Rural Progress," as well as for state and county leagues.

RURAL COMMUNICATION

By *Jesse E. Pope*

Communication, in so far as it affects the social life of a community, has two phases: contact with the outside world through travel and other agencies, and intercourse within the community itself.

Intimate intercourse with the world without breaks down provincialism and sectional bias, and gives unity and direction to national life. A nation can not long survive without the flow of intelligence between the various sections. The extent and convenience of its means of communication are real tests of a nation's civilization.

Equally important is communication within the community, contact of neighbor with neighbor, the coming together to obtain those things that can not be had individually and association for the attainment of common ends. Without such contact and coöperation men grow strange one to the other and sympathy and tolerance disappear.

In this article we shall bring together some of the means of community and inter-community association or communication, although some of these means are more fully discussed elsewhere in the book. This will enable us to get a mental picture of the different cementing forces.

The problem of communication.

The obtaining for the rural community of this blessing of social intercourse within and without is a difficult problem. The farmer carries on his work alone, away from the centers of population, a fact which, together with his intimate contact with nature, makes him independent in spirit; and being outside the currents of thought, he is conservative and slow to accept new ideas. The heathen was the heath man, who, dwelling apart, did not come into touch with the new thought of the city. The growth of the modern city with its intellectual life and its opportunity for all to enjoy the substantial fruits of progress, together with the increased familiarity of farmers with city conditions, have accentuated the differences between urban and rural life—the high degree of socialization on the one hand and the relatively low degree on the other.

The laborer in the city, after eight or nine hours work, rides to his home amid an interesting and everchanging panorama furnished by his kind. His daily paper awaits him; and later in the evening he is free to seek gatherings of his fellow workers, play games in public house or settlement, go to the public library or seek instruction or entertainment in lecture room or play-house. On his Saturday half-holiday, he can go with his family to seek diversion at the park or seashore. On Sunday, the church of his choice is at hand and museums, libraries, and places of entertainment are open to him.

His wife, free from the manifold cares that fall to the lot of many farmers' wives, finds much time for neighborly gossip, and most of her husband's social opportunities are hers also. The children graduate from the day nursery into the kindergarten and thence pass on through the grades to high school and even to college, while to those of exceptional ability the university opens its doors. And all this education, by the best modern methods, is free. In a word, to young and old the modern city furnishes abundant social and intellectual opportunity; according to his taste and capacity, one can know and enjoy the best in art and literature and keep abreast with the world's thought and each is stimulated to contribute to it his share.

All this has been less possible for the farmer and his children unless they deserted the country. So it is that this striking contrast between city and country life is perhaps today the greatest single cause of that so-called rural depopulation which is attracting the attention of statesmen and reformers the world over. It is reasonable to suppose that it can be done away with by perfecting the agencies of rural communication; for by this means the socialization of the country can be made equal to that of the city.

American conditions and their effect on the problem.

Conditions peculiar to America have intensified the problem of communication. Because the country was new and undeveloped, the early settlers toiled early and late to gain a living. They came from various European countries and had different languages, manners and customs and often different forms of religious worship. In New England and the Middle states and in those western communities which were made up of native stock and also in those regions where immigrants settled in colonies, conditions were more favorable to social intercourse. But, in communities composed of an intermixture of natives and foreigners, social life languished. There were communities in the Middle West which were formerly made up of New York and New England people and in which social life was highly developed. Gradually, the farms passed into the hands of Germans or Scandinavians and the school declined, the church was finally closed; even the graveyard was abandoned and many of the dead were removed to cemeteries in neighboring cities.

The American is nomadic; American children seldom spend their lives in the communities in which they were born. Indeed, the average head of the family migrates several times before he is satisfied or is overtaken by time. This constant shifting of population prevents social life from taking root; stability and permanency are wanting. The isolated homestead and the large farm are the rule and neighbors are far apart. The opportunity for social life which the agricultural village affords has been wanting; church and school have been maintained with difficulty and communal life in general has not developed. The isolation has been intensified by the almost universal badness of the roads; intercourse with neighbors has been almost impossible during a considerable portion of the year and farmers have even found it difficult to reach the village. Our fondness for religious sects has broken the church into numerous fragments and weakened its power of leadership; the preacher is poorly supported spiritually and financially, and too often is not of the community.

It must not be supposed that, in countries where these obstacles to communication are lacking or exist only in part, rural social life necessarily flourishes or has escaped decline. The truth is, that in countries such as England and France, where these conditions do not obtain, profound isolation and intellectual and social stagnation prevail, while in all lands a decline of rural social conditions has long been apparent. The fundamental cause of the comparatively low degree of rural communication in all countries must be sought in the revolutionary changes that have taken place in industry.

The effect of industrial progress.

The growth of cities has drained off the more energetic of the country population, and rural communities have been deprived of men with social initiative and capacity for leadership. As a result, there has been a world-wide decline in the intellectual and moral fiber of the people of the country districts.

Furthermore, the growth of cities has destroyed the social importance of the country village; closer contact with the city has made country folk dissatisfied with their simple diversions, and those of a higher rank have not taken their place. The Danish farmhouse was formerly built with a large room especially designed for dancing; but this has fallen into disuse, as country dances have gone out of favor. Today an effort is being made to revive them. In France, every man of leisure who has turned social reformer has a plan for rehabilitating rural recreations, which have sadly declined in that light-hearted country with its village community and strong instinct for the soil. In Ireland, priest and layman are working together to recreate social diversions for the rural young people.

Industrial progress with its division of labor, which has so reacted on urban life as to lessen the occasion and almost destroy the custom of neighborly intercourse, has affected rural life, also. By increasing the natural independence of farmers, it has destroyed a powerful incentive to mutual aid and has played an important part in social decline. Owing to the development of agricultural machinery, the farmer now works alone in his fields and almost unaided gathers in his crops. When hay was cut with the scythe and grain with the cradle, haying and harvesting were social events; for neighbors worked together, going to each farm in turn. Later came the husking-bee and apple-bee, which afforded good excuse for the young to dance and the old to engage in harmless gossip; and the raising of a house or barn was a social event for the entire neighborhood. Many beautiful and simple social diversions grew out of this interchange of work; and such coöperation naturally led to the literary society, the singing-school, and the spelling-school. But all these things, which, simple though they were, constituted powerful socializing factors and were enemies of rural isolation and stagnation, have passed away.

Railroads and rural communication in the United States.

In the early days of our national life, intercommunication was difficult and intelligence from the outside world was scanty and slow in reaching the rural community. Owing to the lack of transportation facilities, surplus farm products could not be disposed of and the stimulus afforded by commerce was lacking. Long-distance travel was carried on by means of water routes and stage lines; and, as turnpikes were few and common roads wretched, stage-coach travel was costly, slow and uncertain as well as terribly uncomfortable, and only those who possessed great hardihood or were driven by stern necessity ventured far from home. Newspapers were scarce and postal facilities poor.

With the coming of the railroads in 1830, a new era in communication began. Despite the greatest difficulties incident to long distances and a sparsely settled country, these great arteries of communication spread in all directions and extended to all parts of the land. Now that surplus farm products could be disposed of, the resulting commerce offered opportunity to come in contact with more distant places and the farmer's horizon was broadened.

The liberal policy of the railroads in offering cheap colonists' and special excursion rates stimulated travel. Farmers' organizations covering a wide area now became possible and agricultural fairs and assemblies of various kinds came into being.

The opportunity afforded by the railroads was all that was needed for a people full of the instinct for travel. Provincialism was swept away, city and country were brought closer together and for the first time a free circulation of ideas became possible. No doubt the railroads have exerted a profound influence on the life of the individual and the stimulus has been felt by the community. But, on the other hand, the consequent concentration of population has undermined the country village and this has reacted unfavorably on rural life in that it has, in a way, intensified certain phases of rural isolation.

The telegraph.

In America, the telegraph has not directly influenced rural life. There has been little attempt to make the service convenient; and although the substitution of the rural telephone for the special messenger has greatly reduced the cost of telegrams, it is still relatively high and they are seldom sent by farmers, in many communities, except in cases of sickness or death.

The telephone.

The telephone has been a great boon to the rural community. A mere plaything at the time of the centennial exposition, in a quarter of a century it has spread all over the country and has become a household necessity. When conditions are taken into account, the development of the telephone in the country has been even more remarkable than in the city. This is particularly true in the Middle West, where many mutual and independent lines are found, and for a merely nominal cost excellent service is secured. At first there was friction, owing to the fact that neighborly curiosity frequently led people to listen to the conversation of others on the same line; where the telephone has been installed in a neighborhood for some time this interference has become much less common—a good example of the telephone's socializing influence.

It is difficult to over-estimate the boon of the telephone to the rural districts; it can be used in all sorts of weather, at all times of the year and practically at all hours of the day. Farmers' wives are no longer so isolated; they can chat with their neighbors and become acquainted with the community doings and can arrange for social gatherings. The doctor can be summoned or consulted without the long trip to the village; farm hands can be assembled and exchange of work arranged; if the thresher is coming on the morrow, the farmer can, in a few minutes, arrange for his help by telephone, whereas without it he would be forced to spend hours and to travel miles.

On many country lines, the weather reports are sent out every day at noon, and at six o'clock a general ring is made and all those who care to listen receive the daily market quotations. These customs are by no means universal but are bound to become so in time; and the farmer who does not trouble to take these reports daily does take them when he has something to do and wishes to know the weather prospects or when he has a load of hogs for sale and wants to strike a good market. In fact, the custom prevails of telephoning to several centers to compare prices and thus buyers in different places are put in competition.

The following statistics give some idea of the importance of the rural telephone in the United States: There were, in 1902, 21,577 rural lines with a total length of 259,306 miles, connecting 266,969 telephones; if we estimate that each telephone sends, on an average, four messages a day, the number of messages for the entire country is 1,067,872 and for a year of 300 working days a grand total of 320,361,600.

Postal facilities.

The postal facilities of a country and the extent to which they are used are a fair index to the intelligence and progressiveness of the people. The United States has been much behind countries of the same rank in furnishing such facilities for the rural districts. Of course the great distances and sparse population of a new country have afforded good grounds for excuse. The farmer has had to get his own mail at the village, often miles away, and in many cases has been forced to depend on the slow-going star route. It is, therefore, not strange that the greatest of all disseminators of intelligence was little used by him. The daily paper, for example, was an impossibility; and since he had no easy way of sending his letters, they were not written.

The step to remedy this condition of affairs was taken in 1896, by the establishment of the first rural free delivery route. By 1900, so generous had been the response of the people that rural free delivery was no longer questioned, and, though it was conducted at a great loss to the Government, it was already the established policy to start a route on the petition of the requisite number of heads of families, provided the Government could furnish the necessary funds. Deliveries are usually made on every business day; in some few instances, tri-weekly. In 1908, about 40,000 carriers were employed, Congress appropriated $34,900,000 as against $40,000 in 1897, and the people served numbered 16,000,000. If we estimate the entire population at 80,000,000, one third of whom live in cities of 4,000 and over, and if we take into account the fact that villages and cities below this size are also not concerned with rural delivery, it is evident that a large percentage of the rural population is being served.

That rural free delivery has greatly increased the demand for postal service can not be questioned. One route, after eighteen months of operation, showed an increase of 18 per cent in the amount of matter collected and distributed. On another the number of daily papers increased from thirteen to one hundred and thirteen in three years; on another the amount of mail more than doubled in four years. Not only is this increased use of the mails important, but the daily arrival of the mail carrier is a whiff of air from without, stimulating the people of isolated districts far from the world currents. Postmaster-general Smith wrote in 1900, "Rural free delivery brings the farm within the daily range of the intellectual and commercial activities of the world, and the isolation and monotony which have been the bane of agricultural life are sensibly mitigated."

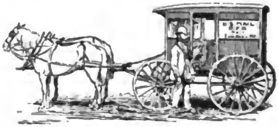


Fig. 86. A typical rural free delivery wagon.

Today, regular carriers deliver and collect mail, act as agents for money orders, and receive and cancel properly stamped letters to be delivered to people along the route. But there is no good reason why their duties should not be greatly extended and the cost of the service to the Government thereby decreased. Rural delivery has exercised a decided influence for good roads, as the Government insists that culverts and bridges be kept in repair; but genuinely good roads would enable the carrier to make use of the automobile and serve a much longer route. The past fiscal year shows a large deficit in this branch of the postal service. Such a condition is hardly in keeping with sound ideas of wise governmental expenditure.

The electric trolley.

The steam railroads offer no special conveniences to the agricultural population as such. They are too far away and trains are not frequent enough. If the farmer could do his chores a little earlier, get convenient and cheap conveyance to the city and return the same night, it would profoundly affect his social life. The interurban trolley renders such access to the city possible, and where it has been installed farmers have been the first to take advantage of it.

If the trolley railway has given the farmer more easy access to the city, the city dweller, on the other hand, has, for the first time, found the country districts within reach; and, as a consequence, pleasure travel from city to country has greatly increased and social intercourse has been stimulated. It is found that interurban lines pay best when they run between the larger cities; this is true because the people of the villages seek the city for business and pleasure. The further decline of the village seems therefore to be inevitable, but since, under conditions which seem to be becoming more general, such villages are playing a less important rôle in the social life of the farmer, their decline ought not to cause concern. Up to the present time trolleys have paralleled steam railroads or have tapped the more thickly settled farm districts. They will, however, render their greatest service when they supplement the steam railroads and provide transportation to those districts to which they have not penetrated.

Good roads (page 320).

Nothing so profoundly affects rural communication as good wagon roads. Rural life is apt to be monotonous and deadening unless farmers can come together socially or for business. Without good roads almost every agent for breaking down rural isolation or quickening rural life is paralyzed. The railroad is less accessible, the trolley can not serve so wide an area and every form of intellectual endeavor is handicapped.

Much can be urged in extenuation of the bad roads in America on account of the scattered population and the lack, in many regions, of material for road-making; but the system of management has been wasteful, magnificent possibilities have been thrown away and there has been no settled policy of road improvement.

With the formation of the Good Roads Association in 1892 the outlook brightened. This organization has had a powerful influence in showing the importance of good roads, in breaking down rural isolation, and in fostering the intellectual and social life of country districts. The separate states have formed good-roads associations, and the meetings and literature of these and the national association play an important part in disseminating information and fostering socialization. Since the formation of the associations, many miles of good roads have been constructed. It ought to be mentioned that the spirit of good roads has encouraged coöperative effort and farmers have graveled many miles of roads, and by uniting in the use of the King road-drag have vastly improved many miles of ordinary dirt roads.

The good-roads movement has received powerful stimulus from the Federal government. In 1893, the Office of Road Inquiry, now known as the Office of Public Roads, was established. The appropriations for its work up to the present time have amounted to $386,050. In addition to publishing and distributing a large amount of material bearing on good roads, the office has directed the construction of 145 object-lesson roads in thirty-four states by way of illustrating road construction in various materials. The general policy of the office is to coöperate in every possible way with all state officials, who are concerned with road improvement.

Some state associations have carried the work still further by beautifying the roads with trees, erecting sign posts at cross roads, naming and numbering farms and surrounding public buildings with shrubs and flowers. What glorious possibilities would be realized if this work could be carried forth! The country dweller would be uplifted and stimulated and love of rural life would fill the nation; city dwellers in automobiles, on bicycles and afoot, would fill the highways and all currents of social life would be quickened. In an address on good roads, President Roosevelt has said, "They are needed for the sake of their effect upon the industrial conditions of the country districts and I am almost tempted to say that they are needed more for their effect upon the social condition of the country."

The rural church (page 297).

Let us now ask the question: What are the farmers doing to foster communication among themselves and what institutions are coöperating with them in this work of rural socialization? As indicated above, the American church has failed to maintain its leadership in the social life of the community. The farmer is not irreligious, but he seldom seeks the church except for marriages or funerals. In Ireland, England, Belgium, Germany and other European countries, the church is a powerful social factor in the rural community; the pastor is a leader of public opinion, and owing to his leisure and peculiar qualifications is well fitted to aid and direct various secular undertakings.

In America, this influence is almost entirely lacking and its absence is much to be deplored. Nothing would do more to stimulate social intercourse than would the strengthening of the rural church. In striking contrast with its low social efficiency in purely American communities are its activity and power in communities ot foreign-born people, particularly Germans or Scandinavians.

Fraternal organizations.

The social work of the church has been partially taken over by the growth of fraternal organizations in rural communities. Chief among these is the grange, which was founded in 1867. Its membership is not confined to the country, though it is primarily a rural organization; it is open on terms of equality to both sexes. Some years ago, the grange movement was injured through its participation in politics; but of late partisanship has been shaken off and the grange has given its energies to fostering the social and intellectual life and furthering the general interests of the community. Its organization is most valuable in promoting many movements for social betterment. (Page 289.)

This change of policy has given it renewed vigor, and its membership and influence are spreading rapidly. Today there are about 30,000 subordinate granges in forty-four states and territories, with a total membership of 1,000,000 for the entire country. Each grange maintains its own lodge rooms, where meetings, banquets and entertainments are held. Much stress is placed on education; lecturers are kept in the field and there is some form of entertainment at every meeting. "Not only has the grange been a distinct factor in the movement for the civil and ethical elevation of the state and nation, the organization has served to give to farming a newer dignity. Incidentally, it has been the training place where hundreds of individuals obtained that skill in parliamentary procedure and public speaking which fitted them for influential office within the gift of the state and national governments."

In the more advanced agricultural states there are few farmers of the younger generation who do not belong to some one of the fraternal organizations, which were formerly confined largely to the cities. Their wives belong to the corresponding orders for women. The intellectual stimulus of such contact with one's fellows can not be overestimated and it is apparent that the lodges have been given new life through the increased membership of farmers.

Agricultural fairs (page 291).

Agricultural fairs have exercised a powerful influence in disseminating intelligence and in bringing farmers into social contact. These fairs are organized by counties, districts, and states. They are held in the autumn and are the most important assemblies that are attended by all ranks of people. During the past decade they have suffered a decline; many counties and districts have failed to hold fairs and of those that have been held many have been little more than racing meets where betting has played an important part. The time of holding the fair is often determined by the convenience of the racing fraternity rather than that of the farmer and his ability to exhibit the triumphs of his husbandry.

It is with very much satisfaction that we see indications all over the land of a return to the earlier ideals; abandoned fair grounds are being reclaimed and the racing feature relegated to a more secondary position. The state fairs, which are permanently located near the centers of the states, have attained a splendid development and have become powerful agencies for disseminating intelligence. The attendance at those located in the heart of the agricultural region often passes the 200,000 mark.

Chautauqua and woman's club movement.

The Chautauqua movement has extended to the smaller centers and has thus reached large numbers of farmers. While the serious study, that is pursued even in the small villages, has not been taken up by the farmers, they do attend the assemblies in growing numbers and the movement, which has attained large proportions, depends in large measure on rural support for success.

The woman's club movement has attained gratifying proportions in the country as a whole and has gained an important foothold in the villages. In New England and, to some extent in the Middle West, the wives of farmers form an important element in the membership and the success of the attempt to reach the country woman has been full of encouragement. Country women are said to prefer the sewing circle to the literary club and it is asserted that there is lack of social sympathy between the women of the villages and those of the country. There is truth in this, but these difficulties have been overcome in some localities and will be eventually in all.

The movement to send organizers to the rural districts is likely to bear much good fruit. When these clubs flourish in the country districts, they will do much to quicken intellectual life and we shall expect them to turn their attention to country beautifying and other lines of civic work which have been carried on so successfully by the clubs in the villages and cities. In the Federated Women's Clubs, of New Jersey, there is a department of forestry, which has for its object the dissemination of information regarding the importance of protecting and extending our forests and the inculcation in the minds of the young of the feeling that trees ought to be loved and protected. The education department seeks to improve the supervision of rural schools, to assist in the establishment of traveling libraries for the isolated districts, and to encourage the study of household and domestic economy. All these subjects directly touch rural life, and this phase of the activity of women's clubs augurs well for their future usefulness in rural districts.

Libraries (page 306).

While the American farmer enjoys his daily paper, magazines of the better class and books for general reading are lacking in the homes of farmers, although there are very many exceptions. The free public library, which has reached such development in the cities and larger towns, has not found its way into the smaller towns and country districts. In some of the older states, Indiana for example, township libraries flourished years ago; but they have been allowed to decline along with other social institutions; and in New Jersey, which is foremost in education, there are many counties with no public libraries and the rural districts almost wholly lack them.

To remedy this deficiency, traveling libraries have been instituted in many states. Those in New Jersey may be regarded as fairly typical. Through the efforts of the New Jersey Federation of Women's Clubs, a law was enacted in 1898 providing for a system of traveling libraries of fifty volumes each, to supply reading matter to towns too small to support public libraries and to rural communities. In order to get a library, a community must present a petition bearing ten signatures and must provide a librarian. The only cost to the subscribers is the annual membership fee of two dollars; all cartage and express charges are borne by the commission.

Fig. 86. A traveling library in a farm home.

The libraries are kept either at the grange halls or at little country cross-roads postoffices and stores. The farmers and their wives use these for meeting places and from time to time the traveling librarian meets them and gives talks on the the books, pointing out the things of peculiar interest and assisting in the arrangements for debates and entertainments. She also visits the farmers' homes and seeks to encourage reading and intellectual effort by interesting herself in their daily life. About 85,000 books, three-fourths of which were non-fiction, were circulated during the year 1907; eleven boys assisted to attend technical schools, forty-seven boys and girls helped to pass examinations for higher training, sixty-one girls assisted in passing teachers' examinations, and thirty-nine farmers' meetings held in addition to the regular grange meetings; at the bureau of information, five reference questions, on an average, have been answered daily. The year's record of work is indeed inspiring and shows what can be done under helpful and tactful leadership.

Colleges of agriculture.

Chief among the socializing forces at work in the rural district are the colleges of agriculture. These colleges number forty-eight and all receive direct aid from the Federal Government. There are also fifteen similar institutions for negroes and Indians that receive federal aid. During their early years, the direct social influence of these institutions can not be said to have been important, as their energies were used in training men technically; apart from bulletins of the station, farmers and the children destined to follow in their footsteps knew little of the institutions founded expressly for their benefit. But this charge no longer holds good. Aside from the free bulletins, which reach a large number of farmers, an extensive correspondence has sprung up between them and the colleges and information and advice are given on request.

Besides the regular courses leading to a degree, short courses are maintained in the winter months especially for young people of simple education who can, however, do the work when it is presented in a practical way. These courses are largely attended by young people who come from the farm and return to it and afford them almost their only opportunity of adding to their scanty intellectual equipment acquired in the rural schools, which most of them leave before the age of fourteen.

To encourage the better selection of seed corn and to influence the rural boy, corn clubs have been instituted by colleges located in the corn-belt. While inspired and fostered by the colleges, they have won the coöperation of other educational institutions; county and township authorities, rural schools and merchants have been enlisted; and while thousands of dollars have come to the farmer through improved seed, what is even more important, social currents have been set in motion which flow to the most remote districts. Seed corn is distributed to boys who have previously formed themselves into a club, and prizes are offered for the best results.

The boys' club in Hamilton county, Indiana, for example, contains 250 boys. On the occasion of the awarding of the prizes—cash prizes offered by the township trustees and other prizes given by merchants—there was a corn lunch, to which every boy member was given a ticket. The club, accompanied by their parents and sisters, took an excursion to the state college at Purdue. They were met at the station by members of the faculty; a special effort was made to show the visitors the workings of the school; a musical program was given; and a trip was taken to the Tippecanoe battlefield. The influence of the club has permeated all parts of the county; farmers are paying more attention to the selection of their seed corn than ever before; they are cultivating their crops with more care; every year some of the boys are put on the program of the farmers' institute.

In another county of the same state, there is a large boys' club, the members of which, accompanied by their families, 700 in all, and headed by the city band, made an excursion to the university. An automobile corn special was run in September for the experts who were to view and judge the boys' plots; and the year's work was closed with a corn-school show, a farmers' institute and a banquet. The University of Missouri has seized the opportunity to incorporate with its boys' club special instruction at the university during farmers' week; one course of a week is arranged for boys between the ages of ten and sixteen; a second, of ten days, for boys sixteen and over. Interest is stimulated by the offering of prizes. A camping trip is also arranged for the boys' club. Work along these lines is gaining ground in all the colleges and its influence in quickening and sweetening rural social life can not be overestimated.

The college is reaching the farmers by coöperating with them and tactfully assuming the leadership in their various organizations and by encouraging them to hold their annual meetings at the college seats. It provides assembly rooms and seeks to make the occasion of special interest, so that "Farmers' Week" has come to be one of the fullest weeks of the college year.

The farmers' institutes have become important agents in stimulating rural social life. They are held in practically all the states of the union; in 1907, there were 20,000 sessions with a combined attendance of over 1,000,000, drawn largely from the rural classes. While it is true that these institutes are concerned with the advancement of technical agriculture, the coming together of so many farmers and their contact with men of superior training and ability gives them a great intellectual uplift, which is reflected by the growing prominence of the social side of the meetings, especially where the institutes are under the supervision of the agricultural colleges.

The institute is not yet as efficient as it ought to be; there is lack of organization and a dearth of men and women properly trained to meet the exacting requirements of an audience of farmers. This important work it seems must eventually be taken over by the agricultural colleges, which must stand between the federal Department of Agriculture and the individual farmer. The Department is issuing annually about 10,000 different pnblications, of which 100,000,000 copies are distributed. But much of this vast quantity of valuable information falls on stony ground, since the average farmer does not usually take time to read it and too often fails to understand what he does read. The information, if it is to enlighten, must be vitalized by the living teacher; and this teacher it is the function of the institute to furnish.

Farmers' specials.—Through the generosity of the railroads, some of the leading agricultural colleges send out trains of cars especially equipped for lectures and demonstrations to tour the state for the purpose of instructing farmers along special lines. The train is accompanied by instructors from the college and by others whose special fields of activity fit them for the work, and thousands of farmers have been reached who, for various reasons, could not be got at in any other way.

Reading-courses.—To encourage reading among farmers and to give it purpose and direction, some of the agricultural colleges have instituted farmers' reading courses. The Pennsylvania State College began such courses in 1892; printed lessons are sent out and examinations are given to those who care to take them; and if creditable work has been done, a diploma is awarded. The courses are technical in character and intensive. In the plan adopted by Cornell University the work is less technical and, while technical reading has not been neglected, the idea has been to cultivate the desire for more general reading, particularly along social and economic lines. Stress is laid on the formation of reading-clubs, to which inspectors and lecturers are sent (chapter VIII).

Other states have established reading-courses according to one or the other of these plans. Through a decade of advertising and careful nursing these courses have become fairly popular; but if the movement be viewed as a whole, it can not be pronounced very successful. Such courses predicate a degree ef socialization and level of education that are not yet possessed by the average rural community. They ought to be the natural outgrowth of the work of the farmers' institute and should develop naturally as the institute becomes more nearly perfect in its development.

The agricultural press (page 71).

America may well be proud of its agricultural press; it is one of its most powerful disseminators of intelligence among farmers; in attractiveness and quality of reading matter it easily holds first place in the world. In the United States and Canada, there are no less than 500 weekly agricultural papers, enjoying an immense circulation; practically every wide-awake farmer takes at least one, and he reads it, quotes it and takes its advice. It is therefore not strange that the agricultural press exerts a stronger influence on rural public opinion than does any other agent; any scheme for rural betterment which does not have its support must inevitably fail to win the approval of the farmers. It is always in the van on questions affecting rural life. Perhaps its most valuable work is the presentation, in various forms, week after week, of the subject matter of the publications of the federal agricultural department and the bulletins of the experiment stations; nor are the reports of foreign countries neglected. Through this persistent setting forth and advocacy of new ideas, many of the improvements in agriculture have been brought about and strong intellectual currents have been set in motion.

The rural school (chapter VIII).

The greatest obstacle to rural socialization is the almost universally low condition of rural education. The educational system ought to give rise to important activities and be a powerful agent in promoting communication; furthermore, unless the rural classes are properly educated, the other social agencies, however numerous and aggressive, must fail. That the rural school fails to perform its mission is patent to any one acquainted with the conditions. We have supposed that a little red schoolhouse at every cross roads was all that was necessary, but while school houses have multiplied, school attendance has fallen off and the development of the rural school has been arrested; it is safe to say that it does not meet the requirements of those dependent on it so well as it did half a century ago. Today much more training is required to enable the country boy and girl to meet the demands on their intelligence. Many rural schools have an enrollment of less than five pupils and in most cases there are too few to be properly graded. The condition in Indiana in this respect is probably typical and is shown by the following statistics:

	1904	1906
Number of schools with attendance below five	44	40
Number of schools with attendance below ten	243	400
Number of schools with attendance below fifteen	1,085	1,201
Number of schools with attendance below twenty	2,006	2,284

The comparison between these two years becomes more striking if we consider that during this interval 151 schools were abandoned.

The school year is short; teachers are inexperienced, poorly trained, and underpaid, and are frequently changed; attendance is irregular, for the children must travel long distances over roads often almost impassable, and owing to the want of emulation and of stimulus to do good work and to the failure to coördinate the lessons with the daily life of the country child, his interest is not won. "The rural school is unsocial; lack of enough pupils to organize a game prevents adequate exercise, and the deadly quiet and inactivity of the small school kills its spirit."

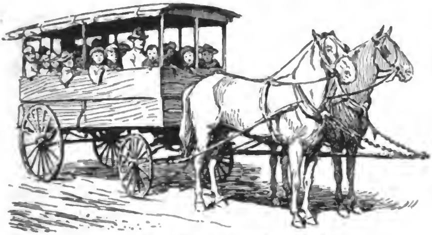


Fig. 87. The transportation wagon for school children.

In the old days, during the winter term, young men and women between the ages of sixteen and twenty-one attended district school, which was taught by a man, and the literary society and spelling school flourished; but today few attend such schools after the age of twelve and fourteen, and the school does little to quicken the life of the community. Its failure has directly contributed to rural stagnation, for country children must remain ignorant or seek the city. Many parents forsake the farm to educate their children. An authority on the conditions in Iowa writes, "10,000 children attend school in the cities and there is scarcely a town in the state where a first class school is maintained but one or more families will be found who have moved from the country to the town for the express purpose of schooling their children."

To better this condition, the rural consolidated school has come into being. This reform was begun in Massachusetts, where the first consolidated school was inaugurated in 1874. The movement has attracted attention in other states and twenty-six have by legal enactment made it possible to consolidate schools under certain limitations; all parts of the country from Maine to California and from Washington to Florida are represented. The consolidated school has attained its finest fruition in the older states of the Middle West, especially Indiana and Ohio; in the former, sixty counties out of ninety have consolidated schools.

The principle of the consolidated school is simple: A strictly modern school building is erected, when possible, in the center of the township; and provision is made to transport all pupils who live too far way to walk. In some cases, the school authorities own the conveyance, and sometimes it is owned by private individuals.

A short account of the consolidated school in Lima township, Le Grange county, Indiana, will show the great possibilities of the rural school. The village of Lima is situated in the center of the township, which has excellent roads. Seventy per cent of the pupils come from the surrounding country and are transported in hacks. Of the 269 children of school age in the district, 160 are in the grades and 90 in the high school. The school year is nine months, and, besides the kindergarten and the nine grades, a four years' commissioned high school is maintained. The four high school teachers are college graduates and all the special and grade teachers have attended special or normal schools. A good modern building stands in the center of a five-acre playground and there is a separate gymnasium. There is a school-garden of 200 plots, and the study of agriculture is conducted in the grades and the high school. The main building contains a hall with raised floor and modern stage. There are a reading-room and a well-equipped library. All the activities of a first-class city high school flourish — a school paper, an orchestra, a school band, boys' and girls' glee clubs and various athletic activities. During the past year a lecture course has been sustained at a cost of about $400, and the hall was found to be too small. The former superintendent says, "The school is the center of the social life of the township. Every Friday night the literary hall is crowded with patrons. The lecture course is liberally patronized; practically every farmer and his family buy tickets, and the general educational status of the community is clearly improved by the lecture courses."

"Owing to the consolidated schools," writes a

Massachusetts authority, "school attendance has increased; we attribute this to the willingness of young married people to settle on the farms, since transportation secures to their children educational opportunities as good as the town provides." In Iowa, "Miles of gravel road have been built by the farmers to facilitate the transportation of pupils. Church and Sunday school are held in the school building, and the hacks used to carry the children during the week are used to some extent to carry the people to church on Sunday."

ROADS AND CANALS

By *L. W. Page*

The natural arteries of rural communication are roads and canals. Their importance has been overlooked in comparison with railroads in recent times; but, in a highly developed society, they really become more important as railroads increase.

I. ROADS

It is worthy of note that from the dawn of history the nations that ruled the world have been foremost as road builders. Egypt, Babylon, Carthage, Rome and France have in turn held supremacy as world powers and as road builders.

Egypt.

The earliest authentic record of permanent roads is found in Egypt. A little to the east of the great pyramid, the remains of a stone causeway a mile long have been discovered, supposed to be a portion of a road built for the purpose of conveying materials across the sands from the Arabian mountains for the construction of the pyramids. As historians place the construction of this pyramid in the fourth dynasty, it would indicate that this road was built about 4,000 years before Christ. Herodotus speaks of the great Egyptian road, on the construction of which King Cheops employed 100,000 men for a period of ten years. This was probably the road that led from Memphis to the great pyramid and is described as having well-paved driveways lined on both sides with temples, mausoleums, porticos and statues.

Babylon.

Babylon, the city of the hanging-gardens and the great walls, did not neglect the construction of roads and bridges, so essential to her military and commercial supremacy. Strabo informs us that the streets of Babylon were paved about the year 2000 B. C., and splendid thoroughfares radiated to Memphis, Suza, Ecbatana and Sardis. Herodotus speaks of "the great royal road," extending from Suza to Sardis, a distance of about 312 miles, along which stations were established at intervals of 18 to 25 miles, where carriers were supplied with fresh mounts. The distance traveled by these carriers is estimated at from 60 to 100 miles a day. Asphalt was used in Babylon for building the great walls nearly 2,000 years before Christ.

Carthage.

Founded between the years 1234 and 835 B. C., Carthage was the first nation to demonstrate the strategic and economic value of improved roads. The wonderful vitality and endurance that she displayed in her long struggle with Rome were largely due to the fact that her splendid system of roads provided an easy means of communication with all parts of her domain. Unfortunately, but little authentic record has remained to the world of the road-building achievements of that great people who fell victims to the solemn edict of Rome, "*Carthago delenda est.*"

Rome.

The deadly foe of Carthage was her most apt pupil, and the despotic sway of Rome for so many centuries over the then-known world was due as much to the remarkable system of roads built by this indomitable people as to the might of her armies. When Rome reached the height of her supremacy, no less than twenty-nine great military highways radiated from the city. Hills were cut through and deep ravines filled in. In Gaul alone, no less than 13,000 miles of road are said to have been improved, and in Britain at least 2,500 miles. The great military roads across the Alps traversed Gaul to Spain, Austria, and the regions of the Danube, and Africa and even Asia were included in this great highway system. So massive was the construction of these roads that the Appian way, called "the queen of roads," and built about 312 years before Christ, was in good repair 800 years after it was built. It is estimated that under present conditions roads such as the Appian way would cost over $200,000 per mile.

The Roman Empire was divided into 113 provinces traversed by 372 great roads, having a total length of about 50,000 miles, so that the cost of the Roman road system under modern conditions would be $5,000,000,000. Their system of construction was crude, expensive, and more massive than conditions required, but they exhibited far more industry and foresight in dealing with their road problem than we of modern times.

France.

After the fall of Rome a long period of inactivity followed, and the roads were allowed to fall into ruin and decay. It was not until the time of Louis XIV that any decided effort was made to improve the roads in any part of Europe. Under the admirable administration of Colbert as Comptroller of Finance, which began in 1661, 15,000 miles of hard roads were constructod. This was done under the old feudal corvée, or forced labor system, and imposed an almost unbearable hardship upon the peasantry. The corvée was finally abolished in 1787, when the nation was on the brink of revolution. The present superb road system of France was founded by Napoleon. He built many great roads through the Empire, among others the road over the Simplon Pass, which was begun in 1800, and required six years for completion. It was at this period that the great French engineer, Tresaguet, published his first treatise on broken-stone roads, and also devised a splendid system of daily reports, which is still practiced by the French government. Too much credit cannot be given to the work of Tresaguet. One type of road designed by him is known throughout England and America today as the Telford road, though much superior in design to any road constructed by Telford. His work preceded MacAdam and Telford by about forty years.

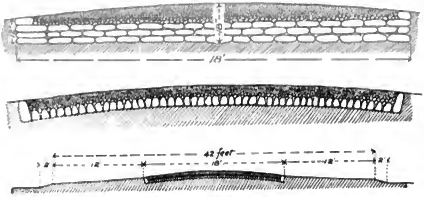


Fig. 88. French roadbeds.

Nowhere is the administrative genius of Napoleon better displayed than in the great organization founded by him which provided trained supervision of every mile of road in France. The basis of the French road system is the School of Bridges and Roads at Paris, maintained by the state, from the graduates of which engineers are chosen to take positions in the administrative system. The course of study lasts three years and the instruction is gratuitous. The whole system is under an Inspector General of Bridges and Highways, who has as his assistants a chief engineer for each department, and under these are ordinary engineers, under engineers, principal conductors, ordinary conductors, foremen of construction gangs, clerks at headquarters and cantonniers. Each cantonnier has from four to seven kilometers of highway under his immediate supervision and lives on the line of his road. He is responsible for its maintenance and keeps the ditches open, fills holes and ruts, removes dust, sand and earth after heavy rains, trims the trees and bushes, and brings to the attention of his chief any conditions requiring unusual attention. Each cantonnier has a book in which the chief cantonnier who passes over the road once a week notes his instructions and checks up the work accomplished. Higher officials inspect the road at regular intervals.

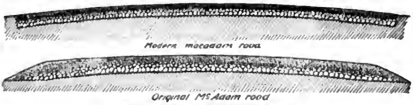


Fig. 89. Forms of MacAdam Road.

The highways of France are classified into national routes, maintained entirely by the general government, connecting the important centers of several departments; department routes connecting the important routes of a single department; highways of grand communication; highways of public interest traversing a single canton, and ordinary neighborhood highways. There are in France 23,656 miles of national roads, which cost $303,975,000. There are 316,898 miles of local highways, which cost $308,800,000, of which the state furnished $81,060,000 and the interested localities $227,740,000. It has been stated that the roads of France are now practically all built, and that the work of the engineers is not to build new roads but to keep those already constructed in a state of high efficiency and beauty.

England.

The principle of local autonomy so prominently displayed in the origin and development of Anglo-Saxon institutions vitally affected the administration of the public roads of England. From the time of the formation of parishes, the people of every parish were expected to keep the roads in their respective boundaries in passable condition. It naturally followed that the roads were for the most part impassable. The first attempt at remedying conditions which had become unbearable was in 1346 when a law was passed granting permission to lay toll on some of the roads leading out of London. This was the beginning of the toll system, equally unsatisfactory for different reasons as the parish system. In 1555, an act was passed providing for the election of parish surveyors and for the working of the roads by labor tax.

Turnpikes, or toll-roads, were first legally erected throughout England in 1663. During the period from 1700 to 1770, 530 turnpike acts were passed by Parliament, and in 1840 there were in England and Wales 104,772 miles of turnpike road. The wastefulness and expense of this system became increasingly apparent and aroused such hostility on the part of the people that armed bodies of men assembled for the purpose of destroying the toll-gates. In 1871, the census showed that 5,000 persons in England and Scotland were engaged in merely collecting tolls. Ireland, in 1857, freed itself from all toll-gates, and turnpike trusts were done away with in England and Scotland by act of Parliament in 1878. Since that time the policy of extreme localization has been gradually superseded by the more rational and practical plan of combining parishes into highway districts and requiring the county to bear a portion of the burden of maintaining the main roads. Since 1882, the general government has assumed a portion of the expense, and the local government board at London now has the general superintendence of the various road systems for the benefit of the nation at large.

It may be mentioned that about 1819 John Louden MacAdam introduced a modification of the broken-stone road that greatly decreased its cost. His method consisted principally in doing away with the hand-laid foundation of large stones and in raising the sub-grade. It is an interesting fact that the system of MacAdam is in general use in France, while the methods followed by Tresaguet and Telford are in general use in England and America.

North America.

Until the settlement of North America by the white man, road building in the modern sense was unknown, although in South America the Peruvians, under the wise government of the Incas, had progressed to an excellence in road building that rivaled the achievements of the ancients. It seems evident that the prehistoric mound builders followed well-defined tracks, and the indications are that one of these tracks led through the pass in the Allegheny mountains now known as Cumberland Gap. The bison, also, was instrumental in supplying this continent with roads, as he trampled out broad "traces" between salt licks and watering places, and these became the roads of the Indians of the plains. In the more mountainous regions, the Indian seems to have availed himself of the tracks made by the deer and other wild animals until he acquired a remarkable knowledge of the topography of the country, which led him to locate trails which centuries later became the highways of travel of modern times.

The first settlers in America clung to the seaboard, and their travel was principally by water-routes. The first road law passed in America was enacted by the House of Burgesses of Virginia in 1632, and provided for the laying out of highways by the governor or the commissioners for the monthly courts, or according as the parishioners of every parish should agree. Subsequent laws passed by the several colonies established the old parish system of England, which has proven as ineffective here as it did there. Turnpikes, constructed of broken stone, were first introduced in this country in 1792, when an act was passed by the Legislature of Pennsylvania incorporating the Philadelphia and Lancaster Turnpike Company.

It is interesting to note at this point that, while toll roads have long since been abolished in England, they are still numerous in this country; that, while the parish system of England has long since been modified, systems modeled after it and containing all of its worst features, prevail in most of the United States. The system that provides for unskilled road supervisors and overseers, and places the burden of maintenance upon the small civil subdivisions, is too well known in this country to require detailed description. It might be added that, while skilled supervision is required in the foremost European countries, including England, no requirement of this kind is made in the majority of the states.

Congress in 1806 passed an act establishing a national turnpike to extend from Cumberland, Maryland, to St. Louis, Missouri. During the construction of this road over seven million dollars was expended, the last appropriation being made in 1838. Within the next eleven years, fourteen highways were authorized to be built by Congress, involving an expenditure of $1,500,000. In 1817, a bill introduced by John C. Calhoun and passed by Congress providing that the dividends from newly chartered national banks should be set aside for road purposes was vetoed by President Monroe, but Congress continued to aid in the construction of roads by appropriating funds realized from the sale of public lands.

Between 1811 and 1845, Louisiana, Illinois, Indiana, Mississippi, Missouri and Iowa were aided in this way. Between 1854 and the beginning of the Civil war, Congress appropriated in all something over sixteen hundred thousand dollars, which was expended chiefly on roads in the territories. Since the close of the war, the national government has rendered no aid to road building, except in an educational sense. The Office of Road Inquiry was established in the Department of Agriculture in 1892, with an appropriation of $10,000 per annum, for the purpose of investigating systems of road management, road materials, giving expert advice and disseminating information. Its scope has in recent years been somewhat broadened and it is now continuing investigative and educational work as the Office of Public Roads with an appropriation of $87,390, and a force of employees numbering 64.

From the close of the Civil war until 1891, a period of almost utter stagnation prevailed throughout the United States in the matter of road improvement, and in fact it is not stating too much to say that the condition of the roads actually retrograded. The appropriations from the national government had ceased, toll roads were being abolished, and no aid was being given from the treasuries of the various states. The roads were worked by statute labor after the method in vogue in England a hundred years previous.

In the year 1891, what is now known as "state aid" was begun in New Jersey. Kentucky had early in the century appropriated money for the support of certain toll roads, and New Hampshire had made appropriations since the year 1800 to improve certain specified roads, but until New Jersey established the precedent in 1891, no coöperative plan whereby the states and the counties were to share the burden of cost had been enacted into law. Massachusetts and Vermont adopted "state aid" in 1892, Connecticut in 1895, New York in 1898, Maine in 1901, Rhode Island in 1902, and other states have followed in recent years until at the present time there are twenty states that are aid-

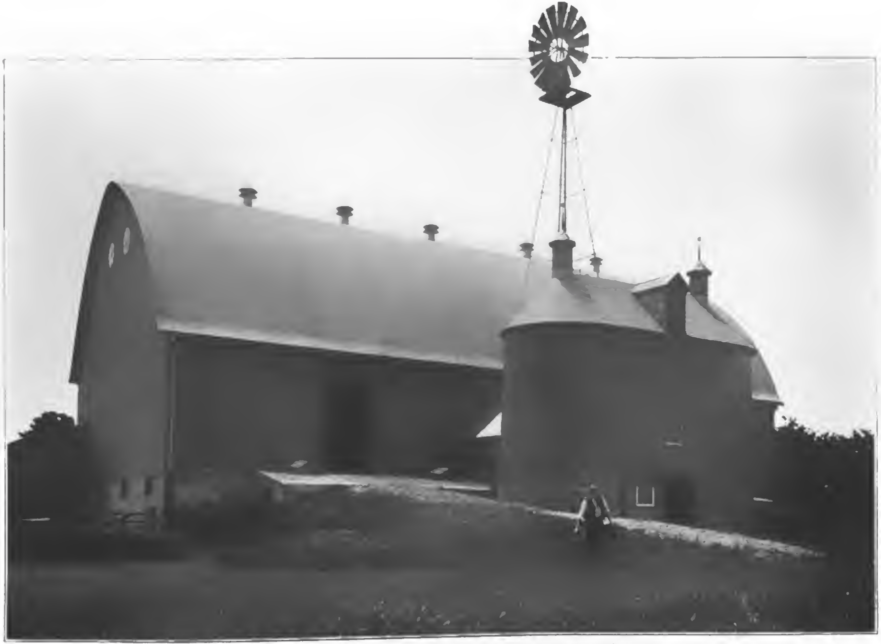


Plate XV. A modern cold-country barn. A French-Canadian establishment

ing the counties by direct appropriations from the state treasury of a certain specified percentage of the cost of roads, or by furnishing road material prepared at state penal institutions, or by furnishing the labor of convicts.

The various state-aid systems differ as to the extent of authority vested in the State Highway Commission, the amount of assistance granted by the state, and the manner and basis of the distribution of the amounts appropriated. A few of the states have established commissions for the purpose of investigating the construction, maintenance and administration of roads, with a view to establishing a state-aid system at a later date.

Experience in foreign countries and in the United States, covering collectively a period of several centuries, has demonstrated beyond all dispute that no general and lasting improvement of the public roads can be secured through any policy that leaves the responsibility and the burden to small civil subdivisions; that toll roads are wrong in principle and wasteful and inefficient in practice; that statute labor provides an undisciplined, unskilled and thoroughly inefficient class of labor; that trained and efficient supervision is necessary in road work just as it is in all other lines of human activity. The present great movement towards state supervision and state aid is proof that Americans are at last realizing the weakness of the old system.

Canada.

In general, highway development in Canada may be said to have followed much the same lines as in the United States. The different provinces vary greatly among themselves as to the details of the systems adopted, but in a general way, with a very few exceptions, they have passed through the same stages. At present, the movement toward centralization and aid from the provincial government is marked. In Ontario, for example, the provincial government at present stands one-third the cost of certain county roads when constructed according to the plans and under the supervision of the Commissioner of Highways. Quebec seems to be the only province in which the toll-road system developed to any great extent.

In the province of British Columbia there is radical departure from the rule stated above. All the roads are located, built and maintained by the provincial government and paid for from the public treasury. Road building has been carried on systematically and scientifically with extremely satisfactory results.

Economics of road improvement.

It is unfortunate that so little attention is given to the economics of road improvement by our educational institutions and by the progressive men throughout the country. The first cost is too often considered prohibitive because little consideration is given to the resultant gain. During the crop year of 1905–6, there were 85,487,000,000 pounds of farm products, consisting of barley, corn, cotton, flax-seed, hemp, hops, oats, peanuts, rice, tobacco, wheat, and wool hauled from farms to shipping-points. This enormous weight did not include the products hauled from farms to mills and from mills back to farms. It did not include all the crops produced, the notable exceptions being truck products and fruit, and no figures are included for forest or mine products, nor for the commodities that go from city to country.

It is evident that the slightest saving in cost of hauling per ton would assume striking proportions when considered for the entire country. Investigations conducted by the United States Office of Public Roads and by various states have established the fact that the average cost of hauling per ton per mile in the United States is about twenty-five cents. The possible saving on transportation over country roads is indicated by the following data on cost of hauling: On broken stone roads, dry and in good order, 8 cents per ton, per mile; on broken stone roads in ordinary condition, 11.9 cents; on earth roads, containing ruts and mud, 39 cents; on sandy roads when wet, 32.6 cents; on sandy roads when dry, 64 cents.

These figures are well supported by consular reports prepared in 1895–6 on cost of hauling in foreign countries that are considered to have first-class systems of improved roads. These figures for Germany, France and England are from a minimum of about 7 cents to a maximum of about 13 cents. When we consider a possible reduction in the cost of hauling from 25 cents to 12 cents, we are considering a possible saving on the twelve crops mentioned of $51,000,000.

The report of the Interstate Commerce Commission for the year ended June 30, 1906, shows that the railroads of this country handled 820,164,627 tons of freight originating on the respective roads. Excluding the products of the mines, which constituted 53.09 per cent, and of manufactures, which constituted 14.81 per cent, we have about 32 per cent of agricultural, forest and miscellaneous products, almost all of which must first be hauled over the country roads. This would give a maximum of 265,000,000 tons of freight annually passing over the country roads, excluding such products of mines and manufactures as are hauled by wagons.

Bulletin No. 49 of the Bureau of Statistics, Department of Agriculture, gives the average haul from farms to shipping points of various farm products ranging from 7.3 miles for oats to 11.8 miles for cotton, the average being about 9 miles. The cost per ton per mile at 25 cents and the distance being 9 miles, it follows that if all of the 265,000,000 tons were hauled over the country roads, the cost would be $2.25 per ton, or $596,250,000. Eliminating $96,250,000, or about 16 per cent of the total for products that may be delivered directly to the railroads from points of origin and disregarding the total mine and manufacturing products and not taking into consideration the immense tonnage hauled by canals, barges and steamers, which are first hauled to the wharves in wagons, we still have a total of $500,000,000 as the cost of hauling on country roads in the United States.

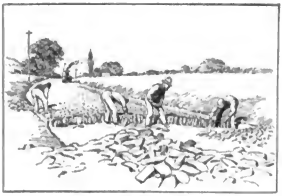


Fig. 90. Laying the Telford foundation.

A reduction in the cost of hauling from twenty-five cents to twelve cents would mean an annual saving of over $250,000,000. There are in the United States 2,150,000 miles of public road. It is probable that at least half of this enormous mileage consists of roads that are unnecessary and but little used. It is a well-known fact that most of the principally traveled roads are improperly located and that distance can be much reduced by relocating. Eliminating the roads that are infrequently traveled, it would be necessary to macadamize only a portion of the total remaining mileage, in order to reduce the cost of transportation, for the reason that a team can exert at least twice its average pull for a short distance, and so that by improving the highways through reduction of grades and utilizing such simple methods as the mixture of sand and clay, the use of gravel, the proper drainage of earth roads, and a careful maintenance of the entire system, maximum loads could be hauled. An average cost of fifteen cents per ton per mile could easily be attained by macadamizing only 25 per cent of our present road mileage. The improvement of this percentage would involve an expenditure of something over two billion dollars, but the reduction of the cost of hauling to fifteen cents would involve a saving of $200,000,000 annually, or 10 per cent of the total outlay.

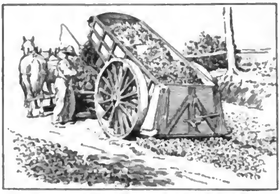


Fig. 91. Placing the macadam foundation.

The great burden now resting upon the producer by reason of bad roads may be illustrated as follows: Although ocean rates were higher than usual during the year 1905–6, the mean charge for carrying wheat by regular steamship lines from New York to Liverpool, 3,100 miles, was only 3.8 cents per bushel, or 1.6 cents less than it cost the farmer to haul his wheat 9.4 miles from his farm to a neighboring railroad station.

One of the greatest advantages which an improved road possesses over a bad road is that it enables the farmer to deliver his produce to local shipping points at all seasons of the year, so that he can select the most advantageous time for his hauling. This is of special importance to truck- and fruit-farmers, as these products are of a perishable nature, and are also subject to wide fluctuations in prices within a short period of time.

The cost of production is controlled by environment. The selling price is usually governed by local conditions and the dictates of powers other than the producer. It is clear then that the difference is the margin left for transportation, storage, commissions, losses, insurance, profits and other items. This margin determines how far a commodity may be carried without loss. It naturally follows that if the cost of transportation is reduced, a greater area of land can be made productive as longer hauls can be made to market at a profit. Some years ago, during a period of low prices, corn was burned as fuel in the Mississippi valley because it would not bear the cost of transportation.

Bad roads materially affect railway traffic, as the crops must be moved when the roads are passable, so that at certain seasons of the year the railways are taxed beyond their equipment, while at other seasons the falling off, due to bad roads, is often as high as 50 per cent at the country stations. This statement is based upon information given by the presidents of the large railroad systems in the West and Northwest. The greater portion of the food supply of the world is brought from the farms to great elevators and storage warehouses, where it is held subject to heavy storage charges. In Chicago, this is equal to nine cents per bushel per year. This costly practice is made necessary by the fact that the crops must be moved to the railroad centers before the common roads become impassable, as otherwise the world might go hungry. If it were possible to store this

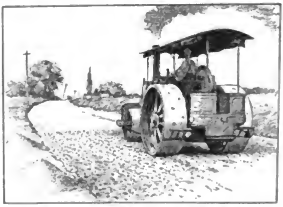


Fig. 92. Surfacing a macadam road.

great food supply on the farms and deliver it as needed, the immense storage tax which the consumer now pays would be made unnecessary and the supplies would be delivered in accordance with the demand. There would be no longer the wild speculation in staples that now exists, as no one man or group of men could corner a single commodity. The producer and the consumer would thus secure the independence that does not at present obtain.

The wear and tear on teams due to bad roads may seem a trivial matter until we take into consideration the fact that there are about 23,500,000 horses and mules in the United States valued at $4,423,697,000, and that over 600,000 wagons are manufactured each year. The reader can form his own conclusions as to how much longer the 600,000 wagons would last, and how much less feed and attention a horse would require, and how much smaller the bills for horse-shoeing, repair of harness and purchase of new harness would be with hard, smooth roads. If by the improvement of the roads the wagons would last one year longer than otherwise, and if one-tenth of the amount paid for feed and attention to horses were saved, the resultant sum would run far into the millions.

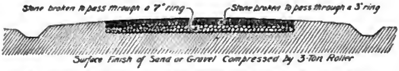

Stone broken to pass through a 7" ring
Stone broken to pass through a 3" ring
Surface Finish of Sand or Gravel Compressed by 3-Ton Roller

Fig. 93. Transverse section of the old Cumberland road. Width cleared for roadway, 66 feet; width graded, 32 feet; width metalled, 20 feet; depth of metal, 18 inches at middle, 12 inches at sides.

An increase in the value of farm lands is the inevitable result of any permanent improvement in the roads. This increase in value of lands has been variously estimated from two to nine dollars per acre. There were, in 1900, 838,591,774 acres in farms in the United States, of which only 414,498,487 acres were improved. An increase of two dollars per acre in the value of these 414,498,487 acres of improved lands would reach the stupendous total of $828,996,000. It is not contended that even this minimum increase would apply to all of the acres of improved land, but no matter how conservatively it is calculated, the sum would still remain far in the hundreds of millions, not taking into consideration the increase in value of the unimproved lands, much of which would be developed as a direct result of being made accessible by the building of improved roads.

Francis P. Loomis, United States consul at St. Etienne, France, reported to the Department of State in 1891 as follows: "The road system of France has been of far greater value to the country as a means of raising the value of lands and of putting the small peasant proprietors in easy communication with the markets, than have the railroads. It is the opinion of well-informed Frenchmen who have made a practical study of economic problems, that the superb roads of France have been one of the most steady and potent contributions to the material development and marvelous financial elasticity of the country. The far-reaching and splendidly maintained road system has distinctly favored the success of the small landed proprietors, and in their prosperity, and the ensuing distribution of wealth, lies the key to the secret of the wonderful financial vitality and solid prosperity of the French nation."

The Land and Industrial Agent of the Southern Railway reported that in Jackson county, Alabama, a bond issue of $250,000 was voted, and within the next two years 125 miles of macadam roads were built. The average value of all farm lands in Jackson county, on the basis of the United States Census of 1900, was $4.80 per acre. The selling price was from $6 to $15 per acre. Within a short time after the completion of the road system, the land increased in value and found ready purchasers at $15 to $25 per acre. In Bradley county, Tennessee, the assessed valuation was a fraction over $9 per acre. One hundred and eighty-six thousand dollars in bonds were issued, which were sold for $210,000. Today, Bradley county has about 160 miles of excellent macadam roads, and lands that were valueless before these roads were built now find ready purchasers at from $15 to $30 per acre.

At present, about 50 per cent of our population live in the country. Owing to the condition of the roads at certain seasons of the year, communication between the country districts and the rest of the world is practically cut off. This great body of our people, therefore, is isolated from the outside world during these seasons and, living apart from one another as they do, an embargo is placed upon social and business intercourse among themselves. They are thus deprived of many of the leading advantages which our present state of civilization and advancement should afford them, and which are enjoyed by those living in cities and towns. A continued deprivation of these privileges has brought about discontent on the farms and has resulted in their abandonment. This is especially true of the young people. Growing weary of the isolation and drudgery of the present conditions of farm life, they are enticed away by the attractions of the city and there are driven into unhealthful occupations.

One of the greatest factors in relieving the isolation and gloom of farm life is the rural delivery of the mails. This service affords the citizen of the rural district an equal opportunity with that enjoyed by the citizen of the city for keeping in touch with the events that transpire in his own country and abroad. Its efficiency depends largely on the condition of the roads and, in fact, in many instances it has been seriously interfered with by the miserable condition of the highways and in some instances suspension has been threatened pending their improvement.

Factors in road improvement.

Resistance of roads.— While no one will dispute the statement that commodities can be hauled more economically over hard, smooth roads than over bad roads, it is of interest to know just why this can be done. A smooth, hard road offers less resistance to traction than a rough or soft road. Careful tests by the most eminent engineers have shown that if a horse can barely draw a load on iron rails on a level road, it will require 1½ horses to draw it on asphalt, 3⅓ on the best Belgian block pavement, 7 on good cobblestone pavement, 13 on bad cobblestone, 20 on an ordinary earth road, and 40 on a sandy road. The resistance in pounds per ton may be stated as follows: On an earth road, 224 pounds; on a hard-rolled gravel road, 75 pounds; and on a hard, smooth macadam road, 45 pounds, the velocity being a pace. This would mean that a load which 1 horse could draw on a hard, smooth macadam road would require 1⅔ horses on a gravel road, and 5 horses on an ordinary earth road. It will thus be seen that by improving the roads much larger loads can be hauled, involving a reduction in the number of draft animals, or an increase in production of marketable commodities.

The reduction of grades is also an important factor to be considered in road improvement. Careful experiments and tests in this and other countries have shown that if a horse can draw 1,000 pounds on a level, he can draw only 900 pounds up a grade of 1 per cent, 800 pounds up a grade of 2 per cent, 400 pounds up a grade of 5 per cent, and 250 pounds up a grade of 10 per cent. It will thus be seen that on a road with a 10 per cent grade, which is by no means uncommon in this country, a horse can draw only one-fourth the load that he can draw on a level. For a short time a horse can exert about twice his average pull, so that short, steep inclines are by no means as great a hindrance to traffic as long hills of slighter grade.

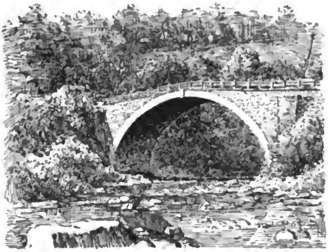


Fig. 94. Typical small bridge on the "old Pike."

Many of our heavy long grades have resulted from the belief that going up one side of a hill and down the other lessens distance. The fallacy of this is clearly demonstrated by the example of the bucket bale, which is no longer when in a horizontal position than when vertical. Most of our public roads have been located in haphazard fashion, and it is usually found that an experienced engineer can obtain a much superior location, and at the same time reduce distance.

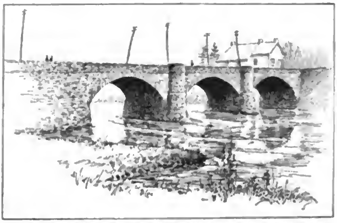


Fig. 95. Stone bridge that carried the Cumberland road across Youghiogheny river. The length of this bridge, known as the "Big Crossings," is 375 feet; date of completion, July 4, 1818.

Present conditions.

The present status of road improvement in the United States may be understood from the following data, compiled by the Office of Public Roads: There were at the close of 1904, 2,150,570 miles of public roads of all classes in the United States. Of these, 38,622 miles were improved by the use of broken stone, 108,233 miles by gravel, and 6,807 miles by miscellaneous materials. The total expenditure in cash was $53,815,387.98 and in labor represented $19,818,236, in bonds $3,530,470.93 and in state aid, $2,607,322.66, making a total of upwards of $80,000,000. It will thus be seen that only a little over 7 per cent of the total mileage of roads has been improved, and that the road-builder has scarcely more than begun his great work.

About half of the states are proceeding under the township and county systems which are antiquated and inadequate. The remainder of the states have either adopted the plan of state aid or of state supervision, or both. Massachusetts pays one-half the cost of improved roads built under her state-aid law; New York, one-half; Ohio, one-fourth; Pennsylvania, three-fourths; Washington, the entire cost of state roads and 50 per cent of state-aid roads; Illinois furnishes to counties and townships crushed stone prepared at state institutions; Virginia and several other states furnish convict labor free to the various counties, and Virginia, also, by a recent law bears a portion of the cost of state-aid roads. New York has adopted an amendment to her constitution authorizing an expenditure of $50,000,000 on the part of the state. The movement is now well under way, and it seems a reasonable prophecy that within the next ten or fifteen years practically all of the states of the Union will be proceeding under a coöperative plan, and much progress may be looked for in road improvement.

II. Canals

Although turnpike roads preceded canals in the completion of lines of considerable length, yet canal- and river-improvement projects were the first to attract public attention. The postponement of canal building to a relatively late date was due principally to lack of capital and to the fact that turnpikes were cheaper per mile than canals.

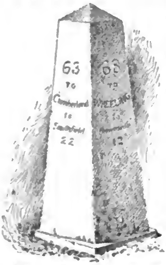


Fig. 96. Old mile post on the National road.

So far as can be ascertained, Lieutenant-Governor Colden built in Orange county, New York, the first canal in the United States, in 1750. This canal was built for the transportation of stone. Apparently the first charter for canal building was issued to the James River Company by the Legislature of Virginia, January 5, 1785. Under this charter, navigation of the James river was improved by the building of a canal about seven miles long and by the construction of sluices in the bed of the river. This work was subsequently enlarged, mainly by appropriations obtained from the legislature of Virginia. This precedent of securing state aid for canals has been often resorted to since that time. Failing to obtain the necessary means from individuals, canal corporations have frequently applied to state and even to national government for assistance, for which shares of stock were usually given.

In 1787, the Dismal Swamp canal was begun under a joint charter from Virginia and North Carolina. It was completed in 1794. George Washington and Patrick Henry were among the owners of stock in this company. The Dismal Swamp canal was built principally to facilitate the movement of timber out of the swamp, but it served a more important purpose in the war of 1812 by furnishing an inland water channel that was free from the attacks of the British.

On June 25, 1792, a charter was issued for canals and locks on the Merrimac river. This canal was opened in 1797. The Middlesex canal was chartered in 1792. The Carondelet canal was built in Louisiana in about 1794, partly as a drainage canal for the city of New Orleans. It was built largely by slave labor contributed by citizens. In 1802, a canal was built in South Carolina, connecting Charleston harbor with the Santee river. It was twenty-two miles long and cost $720,000 but was later abandoned. Other canals proposed and discussed at an early period included one that was the forerunner of the Erie canal, the Chesapeake and Ohio canal, the Delaware and Chesapeake canal, and the Union canal of Pennsylvania, which latter was intended to connect the Delaware and Susquehanna rivers.

The completion of the Erie canal, in 1825, gave great impetus to canal construction. Its success inspired other states to build canals. The shares in many of these projects sold at handsome premiums. In 1832, the shares of the Schuylkill Navigation Company of Pennsylvania sold at an advance of 100 per cent on the original price of shares. At a later period this stock rose to three and one half times its par value. In 1880, there were in the United States 4468 miles of canal, costing approximately $214,041,802. Of these, 1953 miles were abandoned at that time, largely due to railroad competition. The original cost of the remaining 2515 miles was $170,028,636, the gross income being $4,538,620 and the expenses $2,954,156.

Previous to the construction of the Erie canal the cost of transportation was such as to nearly prevent all movement of merchandise. At that time the cost of transportation from Buffalo to Montreal was $30 per ton, and the return transportation $60 to $75 per ton. The expense of transportation from Buffalo to New York was $100 per ton. The cost was about three times the market value of wheat in New York, six times the value of corn, twelve times the value of oats, and far exceeded the value of cured provisions. Prior to the construction of the Erie canal the wheat of western New York was shipped down the Susquehanna to Baltimore, as the cheapest and best route to market.

The average toll of several important canals in 1832 was 2 cents per ton per mile, and the cost of movement 1 cent, making a total average of 3 cents per ton per mile. In 1831, the tolls of the Union canal varied from ½ cent per ton per mile to 2 cents, the cost depending upon the character of the article. The average cost of tolls and carriage on the Erie canal from 1856 to 1872 was 10.02 mills per ton per mile. The cost of transportation on the Erie canal when it was first opened was practically double what it was in 1854. The average cost of tolls and carriage in 1906 from Buffalo to New York, a distance of about 500 miles, was 2.8 mills per ton per mile.

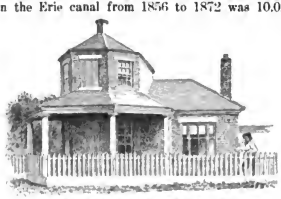


Fig. 97. Toll house on the National road.

Although many of the canals built in the United States have been abandoned, some of them have continued to be useful up to the present time. A few were temporarily great successes, and in the aggregate rendered valuable services to the country, not merely by furnishing avenues for transportation, but in establishing a foundation for the great enterprises by which many of them have been succeeded and supplanted. They stimulated traffic by inspiring producers with the hope of securing a market for the surplus yield of their fields, forests, factories and mines. They established a powerful connecting link between the East, the Middle West, and the Western states, and hastened the development of the upper Mississippi valley.

In many of the older sections, they furnished the first cheap channels of transportation between important local points, and, in promoting coal-mining operations, they laid the foundation for one of the most vital elements in American progress. If they had only demonstrated the feasibility of moving large quantities of anthracite and bituminous coal to the seaboard cities, and of transporting a large percentage of the bread-stuffs and provisions of the West and Northwest to the Atlantic seaboard, they would have yielded to the nation a rich return for their entire cost, and they have succeeded wonderfully in performing these great tasks.

STATE ORGANIZATIONS FOR AGRICULTURE

A study of the organizations in states and territories for agriculture reveals a wide diversity of aims and executive methods. In about thirty-one of the forty-six states of the United States there exist distinct departments of agriculture, in about fourteen states, the department for agriculture is combined with those for other governmental work, for example, Industries, Commerce, Labor and Immigration. In Canada, there are eight distinct provincial departments for agriculture and one for agriculture combined with other industries.

As to date of establishment of the various departments, as far as can be ascertained, two were organized between 1840–50, six between 1850–60, four between 1860–70, eight between 1870–80, eight between 1880–90, thirteen between 1890–1900 and eight between 1900–08.

The chief administrative officer in about twenty-four states and eight provinces is the "Commissioner of Agriculture," while in about nineteen states and one province the secretary of the department or board is the principal executive official. In about half of the states and provinces the administrative officer is chosen by popular vote, in the other half, he is appointed by the governor or premier, by and with the consent of the upper house of the government, or by the board itself.

There are five forms of organization. The first includes those organizations known as "Departments" and consisting of a commissioner and one or more assistants. The second form comprises the boards, which are composed of a varying number of members, some appointed by the governor and others being members of the board by virtue of their official positions in the state. The third includes the bureaus which are essentially the same as the boards. The fourth form is a combination of the first and second; the regular state department is supervised by a board of agriculture. The fifth and final form is that known as the Michigan organization, under which the state board of agriculture is merely a board of trustees for the state agricultural college.

In general, the function of the state and provincial organizations is the same, depending, of course, upon whether or not they have been formed solely for agriculture. The aim of all agricultural departments is the promotion and encouraging of the agricultural interests. As specifically stated in the laws creating the different departments, the aims are numerous and diversified.

But few states have departments that are a regular part of the organized government, that is to say, recognized in the state constitutions. In them, the chief administrative officer is a member of the state cabinet. In the remainder of the states, the organizations for agriculture are creations of the legislature, not being provided for in the constitutions of the states.

Funds for the work of the organizations are derived in three ways: (1) By appropriation by the state or provincial legislative body either in fixed appropriations, annually or biennially, or in appropriations in accordance with an estimate of expenditure furnished in advance by the administrative officer of the agricultural organization. (2) The receipts from the state fair furnish the major part of the funds. A state appropriation supplies the deficiency if there is any. (3) Revenue is derived from the inspection of fertilizers or from the sale of fertilizers, feeding-stuff tags and Paris green and from similar sources. The money thus obtained is turned over to the state treasury and the amount needed to meet the expenses of the department appropriated from it. About three-fourths of the organizations derive their funds as in (1), the rest as in (2) and (3).

In the following sketch, seven pieces of information are given for each state, so far as possible: (1) Name of the department; (2) date of establishment; (3) nature of organization, what the administrative officer is and how chosen; (4) function of the department; (5) relationship to state government; (6) source of funds; (7) kinds of publications.

IN THE UNITED STATES

Alabama.

The Department of Agriculture and Industries.

The department was established in 1888.

The Commissioner of Agriculture and Industries, the administrative officer, is elected by the people. The office is provided for in the state constitution. The commissioner is president of the Live Stock Sanitary Board, also of the Horticultural Board, and is a member, by law, of the Immigration and Forestry Commission. He has charge of the nine agricultural schools of Alabama, which have been established over fifteen years.

This office was organized, primarily, for the benefit of the farmers of the state, but was also incorporated to work for the industrial interests of the state. The Department of Agriculture has largely to do with the nine district agricultural schools and in directing them, together with the Professor of Agriculture at Auburn, in their agricultural work and experiments.

The department has an appropriation made by the legislature, which is sufficient to carry out all its work. The fertilizer interests of the state, which are large, are all supervised by field inspectors, appointed by this department, and for carrying on this work there is a separate appropriation.

Arizona.

There is no department of Agriculture in Arizona.

Arkansas.

Bureau of Mines, Manufactures and Agriculture.

The bureau was established in 1898.

The administrative officer is the Commissioner of Mines, Manufactures and Agriculture, and is chosen by the people.

The bureau is organized to promote mining, manufacturing and agricultural interests.

The publications of the Office of the Commissioner consist of a biennial report, monthly reports as to the condition of crops during season, and literature on the mineral resources of the state.

California.

California State Board of Agriculture.

It has been in existence since 1852.

For many years it was a voluntary organization, but in 1879 the California State Agricultural Society was made a state institution with a board of directors appointed by the governor. The directors of the California State Agricultural Society are twelve in number and are appointed by the governor. They constitute the State Board of Agriculture. The president is elected by the other members. The secretary, an administrative officer, is likewise elected by the other members.

The board is charged with the exclusive management and control of the State Agricultural Society, as a state institution; has possession and care of its property, and is entrusted with the direction of its entire business and financial affairs; has power to make all necessary changes in the constitution and rules of the society; provides for an annual fair, or exhibition, by the society, of all the industries and industrial products of the state, at the city of Sacramento, and such other exhibitions as they may deem important. They elect one of their members as president of the board and society, and a treasurer and secretary, not members of the board. They may also appoint, annually, as officers of the board, a chemist, a botanist, a mineralogist, a geologist, a metallurgist, an ornithologist, and an entomologist, and define the duties of each. They may appoint such committees on the various departments of agriculture, mining and manufactures, either generally or for specific purposes, as they may deem important for the best interests of the state, and require such committees to report the results of their investigations to the board at such times as may be named by them.

The board is not connected with the state cabinet, but the president is ex-officio a regent of the state university.

It derives its funds from admissions and concessions, supplemented by appropriations from the legislature in varying amounts from ten to fifteen thousand dollars a year, and as much more as is obtainable.

Colorado.

The State Board of Agriculture of Colorado.

It was established in 1877.

The members of the State Board of Agriculture are merely trustees of the state agricultural college and not a board with a commissioner, as in many states.

The only funds the board has are those that the college receives from the United States and the state for college and experiment station work.

Connecticut.

State of Connecticut Board of Agriculture.

It was organized in 1866, and reorganized in 1897.

The board has no connection with the Dairy Commissioner, Cattle Commissioner, State Forester and State Entomologist, each of whom receives a special appropriation.

The board is composed of twelve members, eight of whom—one from each county—are elected by the general assembly. Four are appointed by the governor and senate—two at every biennial session. The term of office for all is four years. The secretary is the administrative officer, and is chosen annually by members of the board. He is ex-officio a member of the board.

The function of the board is, in general, to promote the agricultural interests of the state in such a manner "as it thinks proper." The specific functions are the electing of a trustee of the Connecticut Agricultural College, and a member of the Board of Control of the Connecticut Agricultural Experiment Station.

The board is entirely subordinate to the state, and is in no way a part of the state cabinet.

An annual appropriation from the state furnishes the funds for the board.

Delaware.

The State Board of Agriculture.

It has been in existence since 1901, having been organized on February 6, of that year.

The board has a president, vice-president and secretary, the president serving also as treasurer. The executive officer is the corresponding secretary, who is not, however, a member of the board.

The board was created primarily to have control of the diseases and pests of animals and plants, but its scope has been enlarged by giving it some oversight of the farmers' institutes, and by a clause which says that it shall have power, "to devise and execute measures necessary for the agricultural welfare of the state."

It has no organic connection with the state government, and is not in any way a part of the state cabinet.

The board receives annually $3,000 for its general work, and an appropriation of $1,200 is available for the control of animal diseases.

The board publishes, from time to time as occasion may require, bulletins giving directions for the treatment of orchards and crops for the San José scale and other troubles, and upon the prevalence of cattle diseases and their prevention or treatment. A report covering the work of the board is made annually to the governor and by him presented to the legislature at its biennial session. The legislature provides for its publication.

Florida.

The Bureau of Agriculture of the State of Florida.

It was established May 17, 1889.

The Commissioner of Agriculture is the chief administrative officer and is ex-officio a member of the Board of Directors of the Agricultural and Mechanical College of the state. He is chosen by popular election for a term of four years.

The function of the bureau is to promote agriculture in the state. The state constitution defines the duties of the commissioner as follows: "The Commissioner of Agriculture shall perform such duties in relation to agriculture as may be prescribed by law; shall have supervision of all matters pertaining to the public lands under regulations prescribed by law, and shall keep the Bureau of Immigration. He shall have supervision of the state prison and shall perform such other duties as may be prescribed by law."

The Commissioner of Agriculture is a member of the state cabinet.

The funds for maintenance are provided by an appropriation by act of the legislature.

The publications of the department consist of biennial reports on the subjects above enumerated, and quarterly bulletins on crop conditions and results, analyses of fertilizers, stock feed and food samples, under laws controlling such matters, and other miscellaneous subjects of interest or value to the reader and people of the state generally.

Georgia.

Department of Agriculture.

It was established in 1874.

The Department of Agriculture embraces the following departments: State Chemist, State Entomologist, State Geologist, Pure Food Department, and Inspection of Illuminating Oils. The administrative officer is Commissioner of Agriculture, and he is elected by the vote of the people.

The function of the bureau is to promote agriculture in Georgia.

The Department of Agriculture is a part of the state cabinet.

The Department of Agriculture has an annual appropriation of $10,000, with which to pay salaries and expenses. A revenue of from sixty to seventy-five thousand dollars, annually, is turned into the state treasury from the inspection of fertilizers and cottonseed meal, after all expenses have been paid. The State Chemist and State Entomologist each get an appropriation of $10,000 annually, for salaries and expenses. There is no appropriation set aside for the inspection of illuminating oils, but a fee of one-half cent per gallon is charged for inspection, and out of the funds thus arising the inspectors are paid and the balance turned into the state treasury.

The publications of the department are: Bulletins on commercial fertilizers, on pure food, various crops, and similar subjects. The state entomologist publishes quarterly bulletins on all the pests of the crops and fruits.

Idaho.

The State Bureau of Immigration, Labor and Statistics embraces the agricultural department of the state.

The department was created in 1899.

The law establishing the department provides for a commissioner, with clerical assistants, and defines the duties of the commissioner. He is to encourage immigration to the state, collect all labor, agricultural, industrial and other statistics, and publish them in a report, biennially. The commissioner is appointed every two years by the governor, with the consent of the senate, and the clerical help is chosen by the commissioner.

The function of the department is to collect and publish the statistics and resources of the state—resources developed and undeveloped—solicit desirable immigrants for its further development, and answer all inquiries coming to the state in reference to its resources and advantages, and the like.

It has no relation to the state government, other than stated above. Idaho has nothing resembling a cabinet.

The State Bureau of Immigration, Labor and Statistics makes an annual report to the governor, and states its needs in the matter of money for the future, and the governor, through his message to the legislature, makes these needs known. The committee on appropriations of the lower house of the legislature calls the heads of the state departments before it and questions them touching the lowest amount of money needed for their respective offices for two succeeding years, and appropriates sums in accordance with the revenue of the state for the same two years. The funds for the support of all the offices of the state are derived from state taxes, except a few of the state institutes, which are supported, in part, by land-grants from the general government.

Illinois.

Illinois State Board of Agriculture.

The date of establishment was 1853.

The organization consists of president, vice-president-at-large and one vice-president from every congressional district in the state. They are elected by a convention of delegates.

The function of the department is gathering, compiling and publishing crop statistics, conducting the Illinois State Fair, and taking charge of all matters pertaining to agriculture.

The department has no relation to the regular state or provincial government, nor is it in any way a part of the state cabinet.

The state appropriates $18,000 anually for the expenses of the department.

Indiana.

Indiana State Board of Agriculture.

The board was incorporated by an act passed February 17, 1852. It had been in existence some time before this.

The board appoints a president, secretary and treasurer, and such other officers as it deems necessary. The president is the executive officer. The president of every county agricultural society, organized under the state board, is ex-officio a member of the board. Vacancies are filled by the vote of the presidents and delegates from the county societies.

The board reports yearly the condition of agriculture in the state. It conducts the state fair and promotes agriculture in various ways.

The president is not a member of the state cabinet.

The bill of expenses of the board, after being approved by the state auditor, is paid by the state treasurer.

Iowa.

The Iowa Department of Agriculture.

It was established in 1900.

The department is managed by the State Board of Agriculture, of which the Governor, the President of the State College of Agriculture and Mechanic Arts, the State Dairy Commissioner and the State Veterinarian, are members ex-officio. The other members of the board consist of a president, vice-president, secretary, treasurer and one director from each congressional district (the secretary is elected by the board for a term of one year). The officers and directors are elected annually by a convention composed of delegates, one from every recognized district or county society. In counties in which there are no such societies the supervisors appoint the delegates. The department embraces all district and county agricultural societies, the state crop and weather service, and the offices of the Dairy Commissioner and State Veterinarian.

The function of the department is to promote agriculture, horticulture, forestry, animal industry, manufactures and domestic arts.

The funds are derived from state appropriations for such sums as the board shall recommend as being necessary. There is a fixed allowance for office expenses.

Under the present law, the department is only authorized to issue the Iowa Yearbook of Agriculture. This book is published annually and contains about one thousand pages. The Weather and Crop Service, which is a branch of the department, issues a weekly crop bulletin during the growing season, a monthly weather and crop bulletin, and a biennial crop report containing a summary covering the two years immediately preceding the date of publication.

Kansas.

The State Board of Agriculture of Kansas.

It has been in existence since 1872, being the outgrowth of the Kansas State Agricultural Society, which was organized in 1862.

The board proper consists of ten members, a president, vice-president, secretary, and treasurer, and is entirely of a non-political character. The annual meeting is fixed by law to convene on the second Wednesday of January. The secretary is the executive officer, is elected for two years, and is the only salaried officer. The other officers are elected annually, the members are elected for two years, and the terms of half of them (five) expire each year. The members and officers have a vote in the annual meetings on all questions, and in the election of officers, as do the delegates, the latter dominating as to numbers—one for each county and district agricultural society—sent by the societies that have made monthly reports to the board of crop conditions, etc., as the law requires, or as requested. The governor and secretary of state are ex-officio members of the board.

The work of the board covers a wide scope, comprising the collecting, publishing and disseminating of practical, helpful information to the producers of the state, and the gathering and making record of the state's population, agricultural and live-stock statistics, to advertise the state, its resources, productions and possibilities, and, as stated in the constitution of the board, "to encourage immigration, and promote the improvement of agriculture, horticulture, stock-raising and manufacturing in the state of Kansas."

The state legislature provides adequate appropriations for the furtherance of its work. No other funds are at the board's disposal than those appropriated by the legislature. Every tenth year ending with five the board is required to take, through township assessors, a complete state census, going much more into detail than ordinarily, and for its compilation is given that year about $3,000 for extra clerk hire. The board is given rooms, and maintains an agricultural museum in the state capitol. The board's publications are distributed free to Kansas.

The board issues quarterly reports of 250 to 450 pages, devoted principally to special farm topics, as The Helpful Hen, The Beef Steer (and His Sister), Cow Culture, Alfalfa-Growing, Modern Sheep, The Horse Useful, The Corn Book, Wheat Growing; Forage and Fodders, Pork Productions; and biennially, larger, cloth-bound volumes, in editions of 20,000 copies, containing information on various pertinent subjects. These publications are profusely illustrated, and many are used as text-books in schools and colleges.

Kentucky.

The Bureau of Agriculture, Labor and Statistics of Kentucky.

The bureau was established April 2, 1892.

It was organized to promote the agricultural interests of the state, to disseminate agricultural information, collect and compile statistics on labor and other general statistics and promote forestry and immigration. The Commissioner of Agriculture is elected by the people to serve for a term of four years.

The bureau is one of the component parts of the state government. The commissioner is one of the state officials.

The sum of $33,000 is appropriated annually by the general assembly of the state of Kentucky.

The Bureau of Agricultural Labor and Statistics has an annual appropriation of $13,000 and the State Board of Agricultural Forestry and Immigration has an annual appropriation of $20,000. Two thousand dollars is used for forestry and $2,000 is used for immigration.

Louisiana.

Louisiana State Board of Agriculture and Immigration.

The board was created in 1880.

The Commissioner of Agriculture is the chief administrative officer. He is elected by popular vote.

To promote agriculture and encourage immigration in the state.

Appropriations are made biennially by the general assembly according to a fixed scale of expenditures. These appropriations may be increased or modified at a subsequent meeting of the assembly. There is considerable revenue derived from the sale of fertilizer and feed-stuff tags and Paris green. This goes to the experiment stations in the state.

The publications are a map of Louisiana with descriptive matter on reverse side, quarterly crop reports, farmers' bulletins, parish fair bulletins, lectures in annual and biennial reports.

Maine.

Maine Department of Agriculture.

The department has been in existence since 1855.

At first its membership consisted of one person from each agricultural society that represented the whole or a division of a county. In 1860, the law was changed, and from then until 1870 the membership consisted of only one person from each county. In 1870, an act was passed by the legislature empowering the governor to appoint five members at large, and also giving the right of representation to the State Agricultural Society. In 1873, the State Pomological Society was given membership, and this right was given to the Maine Poultry Association in 1875, and to the Maine Dairymen's Association and the State Jersey Cattle Association in 1878. In 1880, an act was passed reducing the membership of the board to one member from each county, elected by the agricultural societies in the county, and two from the state college. The board elected a secretary, who was its executive officer. In 1901, the Board of Agriculture was abolished by the legislature, and a Department of Agriculture created.

The administrative officer of the department is a Commissioner of Agriculture, elected biennially by the legislature.

The function of the department is the more complete development of the natural resources of the state, and the advancement of agriculture in all its branches.

It is one of the state departments.

The funds at its disposal are $3,000 annually for farmers' institutes and a state dairy conference; $30,000 for the protection of trees and shrubs from dangerous insects and diseases (a large part of which is devoted to the suppression of the gipsy and brown-tail moths); $3,000 for improving and protecting the dairy interests of the state, which includes the salary of a state dairy instructor; $500 for the enforcement of laws relating to dairy products. These amounts are all direct appropriations made by the legislature.

Maryland.

The Board of Trustees of the Maryland Agricultural College is the State Board of Agriculture of Maryland.

The board was established in 1856.

There are six ex-officio members, the Governor, State Treasurer, Comptroller, Attorney-General, Speaker of the House, and President of the Senate; six gubernatorial appointees, one from each congressional district, and lastly five stockholding members making seventeen in all. The governor of the state is president of the board, and has considerable influence by his advice and official position. The Secretary of Agriculture of the United States is a member ex-officio of the Board of Trustees. The Board of Trustees of the Agricultural College and Experiment Station is the Board of Agriculture of the state, and all matters relating to agriculture in the state, are directly under its control.

The board has charge of all matters pertaining to agriculture in the state, with the exception of the Bureau of Immigration. It presides over the affairs of the Agricultural College and Experiment Station, and directs the animal food and fertilizer control, the state horticultural work, the farmers' institute work, and will soon have under its jurisdiction the pure food law of the state.

The funds at its disposal are the national grants (within the limitations of the provisions of these national acts), the income from the food and fertilizer control, and state appropriations for the state horticultural work and the farmers' institute work, together with appropriations for buildings and equipment and maintenance by the state legislature.

Massachusetts.

State Board of Agriculture.

The board was established in 1852.

The Governor, Lieutenant Governor, Secretary of the Commonwealth, President Massachusetts

Agricultural College, State Forester, and Secretary, Chemist and Chief of Cattle Bureau are ex-officio members of the board; three members are appointed at large by the governor for three-year terms; the rest (at present time, thirty-two) are elected for three-year terms by certain incorporated agricultural and horticultural societies. All of these societies, except the Massachusetts Society for Promoting Agriculture, which has a member by special legislation, draw an annual bounty from the commonwealth. The administrative officer is a secretary elected annually by the board.

The office of the secretary is in the state house, and virtually constitutes the agricultural department of the commonwealth.

The secretary and his assistants are salaried officials like those of the other state departments. There is no state cabinet as such.

The funds are derived from the legislature as annual appropriations. No other funds are under the control of the department.

The publications of the state board are the annual report, 15,000 copies; monthly crop reports, May–October, 5,000 copies; nature leaflets and special reports from time to time with varying editions.

Michigan.

There is properly no Department of Agriculture, but, under an act of the legislature passed in 1881, the Secretary of State was authorized to collect and distribute certain information in regard to agricultural matters in the state. This work has been done under what is called the Division of Agriculture, which is a department of the Secretary of State's office.

Its function is to obtain monthly statements as to the condition of live-stock, the condition and prospects of growing crops, and as soon after the harvest as possible a statement as to the yield of wheat and other farm and field products, and also to ascertain the quantity of the various farm products that are marketed, and the quantity that remain in the hands of the farmer. The information thus obtained is distributed monthly in the form of an abstract. The reports are made to the department by voluntary correspondents, and distributed throughout the various townships of the state. The sole purpose is to show the existing conditions of growing crops and the status of crops already matured as to the matter of sales.

The publications consist of monthly bulletins and crop reports.

Minnesota.

There is no state institution known as the agricultural department, other than that connected with the Minnesota University, therefore the State Board of Immigration takes its place.

State Board of Immigration.

It was organized August 5, 1907.

It was organized to spread knowledge of the resources of the state of Minnesota to all the civilized world.

Commissioner of Immigration, appointed by the board, is the chief administrative officer.

The department is a part of the regular state government.

Funds are annually appropriated by the legislature of the state.

Mississippi.

The Department of Agriculture and Commerce.

The department was created in 1907.

The administrative officer is the Commissioner of Agriculture, Statistics and Immigration, and he is elected by popular vote. His term of office is four years. He is allowed one clerk.

The purpose of the departments is shown by the duties of the commissioner, which are to encourage agriculture, to promote agricultural organizations, to collect and publish statistics, and such other information regarding the industries of the state as may be of benefit in developing the agricultural resources, to order investigations of diseases of grain, cotton, fruit or other crops of the state, and of insects injurious to crops, to investigate grasses, to promote dairying and the raising of stock and poultry, to investigate sub-soiling and drainage and to encourage and promote agriculture in any way possible.

The funds are appropriated biennially by the legislature.

The only publication of the department is The Bulletin, issued monthly and mailed to farmers in different parts of the state.

Missouri.

State Board ot Agriculture.

It was organized March 13, 1865.

The board is composed of three ex-officio members, namely, the Governor, State Superintendent of Schools, and the dean of the College of Agriculture; also sixteen corporate members, one from each congressional district, appointed by the governor for a term of three years; the members being divided into three classes, the term of one-third expiring each year. The law provides that not more than a majority of the members shall be of any one political party. The executive officer is the secretary, who is elected annually by the board.

The law sets out the duties of the board as follows: "Shall have supervision over all the legalized departments and institutions of the state which are for the advancement of agriculture. It shall, as a body, or by a committee selected by the board, be a board of examiners of the State Agricultural and Mechanical College and Experiment Station. It shall have charge of the veterinary service of the state; shall gather crop and stock statistics, meteorological data, and information as to the best and most profitable means of farming, stock-raising, fruit-growing, etc., and publish the same in bulletins as regularly as may be deemed expedient; shall hold farmers' institutes in different parts of the state for the purpose of giving instruction in agriculture; shall make an annual report to the general assembly of the state, embracing the proceedings of the board for the past year, and an abstract of the reports and proceedings of the several agricultural societies of the state, accompanied by such recommendations, including especially such a system of public instruction on these subjects as may be deemed useful." The last legislature added a Department of Roads, under the supervision of the State Highway Engineer.

The board is not in any way a part of any state cabinet, and, except as above noted, has no official relations with any other state department.

The board receives for its different lines of work biennial appropriations. These funds are all derived from state revenue by direct appropriation.

Montana.

Montana has no state agricultural department.

The Bureau of Agriculture, Labor and Industry is statistical only and has no executive authority.

The Commissioner of Agriculture, Labor and Industry is the administrative officer of the bureau.

The publications of the bureau consist of a biennial report, which contains a review of the agricultural and industrial advance of the state, which is circulated for advertising and reference purposes. The report also contains sociological and labor statistics, meteorological tables, and an official directory.

There is also a State Board of Horticulture, consisting of six members, appointed by the governor. The governor is ex-officio a member of the board. A secretary is appointed by the board itself.

Nebraska.

Nebraska State Board of Agriculture.

It has existed since October 14, 1858.

The chief administrative officer is the secretary. The board is self-perpetuating, and the officers are elected by the members from their own numbers. The presidents of every county society or duly elected delegates are ex-officio members of the board. County societies are organized with optional county aid and are part of the State Board of Agriculture, and are bodies corporate and politic capable of suing and being sued and of holding real estate in fee simple.

Its function is the improvement of agriculture in the state and the holding of the annual state fair.

The funds are derived from the proceeds of the state fair, and from a fixed state appropriation of $2,000 per annum.

The state board publishes an annual yearbook of 400 pages in which are reports of its officers and articles on agriculture and kindred subjects.

Nevada.

State Board of Agriculture.

It consists of twelve men appointed by the governor.

It has charge of the annual state fair and is organized to promote agriculture and develop the resources of the state.

The establishment of county or district agricultural associations is authorized, and county commissioners may appropriate sums not exceeding $1,500 for the support of fairs held by such organizations.

New Hampshire.

State Board of Agriculture.

It has been in existence since 1870.

The secretary is the administrative officer and is elected by the board for a term of two years.

The function of the department is to hold farmers' institute, to issue licenses for the sale of fertilizers and feeding-stuffs, and to advertise the attractions of the state to procure summer and other residents.

It is in no way a part of the state cabinet; it is independent and subject only to its own regulations.

It receives such funds as are apportioned from time to time by the governor and council.

New Jersey.

State Board of Agriculture.

It was established in 1873.

The administrative officer is the secretary, who is elected by the farmers at their annual convention and who acts under the direction of the executive committee. There is also a president, vice-president, and treasurer.

The function of the department is, briefly stated in the law, as follows: "The State Board of Agriculture shall have full power to investigate such subjects relating to the improvement of land and agriculture in its various branches in this state as they may think proper. That, in order to collect and disseminate reliable and useful information, and to encourage a higher standard in the agriculture and horticulture of the state, the executive committee is hereby authorized to cause to be made experimental and practical tests of specific remedies or cures of diseases of domestic animals and poultry, and of plants, vegetables and fruits, and insects injurious thereto, and to employ suitable persons to lecture before the State Board of Agriculture at its annual or other meetings, and in the counties of the state as far as the sum herein appropriated will allow."

It is not a political organization although it is constituted by state law and has its regular office in the state house. The office is frequently consulted on state matters.

Six thousand dollars to $8,000 is at the disposal of the board annually, which is appropriated out of the state treasury.

The board publishes every year a report of its proceedings, containing the annual report of the secretary, address of president, and other officers, and a statement of crop yields and values for the year. Occasionally, as may be deemed needful, bulletins on particular subjects are issued; as on Dairying in New Jersey, Forage Crops for the Dairy, Sweet Potato Production, Diseases of Swine, Foul Brood: Its Cause and Cure. It also issues a monthly crop bulletin throughout the growing season.

New Mexico

There is no territorial department of agriculture in New Mexico. The Department of Agriculture of the United States has experimental stations throughout the territory.

New York.

The Department of Agriculture.

The Department of Agriculture was created by Chapter 338, Laws of 1893. The department immediately succeeded the Dairy Commissioner, which position was created by Chapter 202, Laws of 1884.

The administrative officer of the department is the Commissioner of Agriculture, who is appointed by the governor, by and with the advice and consent of the senate.

The Department of Agriculture is organized to enforce the agricultural law.

The department is a part of the executive branch of government, but has no official relations with other branches of government.

Appropriations are annually made, according to a schedule of expenses, by the state legislature.

The publications of the New York State Department of Agriculture consist of an annual report to the legislature. Volume I is the report of the work of the department; Vol. II, the report of the Agricultural Experiment Station of Cornell University; Vol. III, annual report of the New York Agricultural Experiment Station; Vol. IV, annual report of the Bureau of Farmers' Institute. These annual reports include all of the pamphlets and publications that are issued irregularly during each year. During the last year, the department has issued the following pamphlets:

The Agricultural Law, bulletin on Butter and Cheese Factories, Milk Stations and Condenseries, bulletin on Horticultural Inspection, Formulas of Insecticides and Fungicides, Diseases Among Bees and Treatment, list of Farms Occupied and Unoccupied for sale, Bureau of Information and Statistics, Information to Nurserymen and List of Nurserymen Holding Certificates of Nursery Inspection.

North Carolina.

North Carolina Department of Agriculture.

The department was established in 1877.

The organization is governed by the Board of Agriculture, with the commissioner as administrative officer. The commissioner is elected by popular vote.

It is organized to foster and promote agriculture.

It is a branch of the state government, but not a part of the state cabinet.

The department is supported entirely by funds derived from a tax of twenty cents per ton on all fertilizers, cottonseed meal and commercial feeding-stuffs sold within the state.

The department publishes monthly bulletins on farm subjects, fertilizers, analyses, pure-food work, reports of farmers' institutes work, and the like. Besides this, many special bulletins are published.

North Dakota.

The Department of Agriculture and Labor.

It has been in existence since statehood in 1889, having been created by the constitution.

It is administered by a Commissioner of Agriculture and Labor, and is chosen by election of the people.

The department is organized to preserve statistics with reference to agriculture and labor, and to exploit the resources of the state with a view to securing immigration.

It is a coördinate department of the administrative branch of the government, and its head is a member of the State Board of Equalization, which equalizes the assessed values of the state for purposes of taxation.

The salary of the commissioner and of his deputy and clerks is provided for in the general appropriation bill, and it has a fund of $20,000 biennially provided for by special appropriation for promotion of immigration.

Ohio.

The Ohio State Board of Agriculture.

The State Board of Agriculture was organized in the year 1846.

It consists of ten members appointed by the governor by and with the advice and consent of the senate. The board thus appointed elects a secretary, and he, with the advice and consent of the board, appoints the heads of the several divisions of the department and appoints all of the minor officials. The State Board of Agriculture has special charge of, and conducts the Ohio State Fair. The secretary of the board, together with the appointees above mentioned, constitute the Department of Agriculture. The Department of Agriculture consists of a secretary, state veterinarian and assistant veterinarian, chief inspector of nurseries and orchards and assistants, chemists, deputy inspectors of commercial fertilizers and commercial feed-stuffs, statistical clerks, correspondence clerks, stenographers, and the like.

The board, or practically the secretary of the board, conducts farmers' institutes, the expense of which is borne by the several counties of the state, according to population. The state gives aid to four farmers' institutes in each county each season. There are from twelve hundred to fifteen hundred volunteer crop and stock correspondents. The aim is to have one in every township, who make monthly reports to the department. These are compiled, and many thousands of reports published monthly for distribution.

The State Board of Agriculture is a department of the state government, has offices in the capitol building, and is supplied with stationery, fuel, lights, etc., the same as other state departments.

The general assembly makes no regular appropriations—in fact, no appropriations at all for the support of the state fair, but when deemed necessary it makes specific appropriations for the purchase of land, erection of buildings, and similar things. The balance of the expense of the annual fairs is paid from profits of holding these.

The general assembly appropriates annually $26,000 for the encouragement of agriculture. This is for salaries and running expenses of the department. The last assembly appropriated $2,000 for ordinary repairs and improvements on state fair grounds, and $5,000 for suppression and prevention of disease among live-stock.

Oklahoma.

Oklahoma State Board of Agriculture.

It was organized on November 21, 1907. Statehood was granted on November 16 of the same year.

The Board of Agriculture is composed of eleven members, all of whom are farmers and are selected in a manner prescribed by law. The board is maintained as a part of the state government and has jurisdiction over all matters affecting animal industry and animal-quarantine regulations and is the board of regents of all agricultural and mechanical colleges, and discharges such other duties and receives such compensation as may be provided by law. The administrative officer is the president, who is, and will be, appointed by the governor until 1910, after which time he will be selected by a direct vote of the people.

The president of the Board of Agriculture is also a member of the School Land Commission Board, the State Banking Board, State Board of Equalization and State Board of Control (which has charge and management of state prisons and all convicts within the state). He is a member of the State Board of Pardons, a member of the State Commission of Agricultural and Industrial Education, and member of the Board of Regents of the State School of Mines. The office pays a salary of $2,500 per year.

Every regular biennial session of the legislature, appropriates a fixed sum in advance for the maintenance and operation of the Board in its various lines of work for the succeeding biennial period. Beginning with statehood, the appropriation for the nineteen and one-half months, ending with July 1, 1909, was $101,399. The Board of Agriculture of this state has more extended and varied powers than that granted to any other like board in the United States.

The publications are monthly crop bulletins, regular quarterly reports, biennial reports, live-stock and quarantine rules and regulations, nursery regulations, college catalogue, experiment station bulletins, and farmers' institute bulletins.

Oregon.

Oregon State Board of Agriculture.

It has existed since 1861.

It consists of a body of five persons appointed by the governor of the state. Officers (president and vice-president) are elected from this body and a secretary is elected, who must not be a member of this organization.

Its function is to encourage agriculture and to promote its interests in general; the main work done by this organization up to the present time has been to organize and conduct the Oregon State Fair every year.

It is not a part of the state cabinet.

A $10,000 appropriation is annually made in favor of the State Board of Agriculture, which is to be used as a premium fund only for the products of the state, and no portion of this amount can be used for other purposes than in premium form.

Pennsylvania.

State Department of Agriculture.

It was established in 1895.

The chief administrative officer is the secretary of agriculture, who is appointed by the governor, by and with the consent of the senate, for a term of four years. The Secretary of Agriculture is ex-officio secretary of the State Board of Agriculture. There is a deputy secretary appointed by the governor for a term of four years. The deputy secretary is, by virtue of his office, Director of Farmers' Institutes.

The other officers of the department are appointed by the governor for the term of four years, and are an Economic Zoölogist, a Dairy and Food Commissioner, who has practical experience in the manufacture of dairy products, and a State Veterinarian who must be a graduate of some reputable veterinary college. The governor appoints the chief clerk of the department, the stenographer and the messenger. The Dairy and Food Commissioner and the Economic Zoölogist each have a clerk, who is appointed by the governor, and who serves under the direction of the respective commissioners.

The function of the department is to encourage and promote the development of agriculture, horticulture, forestry and kindred industries; to collect and publish statistics and other information in regard to the agricultural industries and interests of the state; to investigate the adaptability of grains, fruits, grasses and other crops to the soil and climate of the state, together with the diseases to which they are severally liable and the remedies therefor; to obtain and distribute information on all matters relating to the raising and care of stock and poultry; the best methods of producing wool and preparing the same for market, and to prosecute all such similar inquiries as may be required by the agricultural interests of the state. It has charge of the analyses of commercial fertilizers, the gathering of samples, and the analysis of feeding-stuffs and linseed oil, and the like. The department, through its various divisions, touches every line of the agricultural life of the state.

The department is a part of the state government, and the head of the department is a member of the state cabinet.

The money, with the exception of the fertilizer fund, is derived by appropriations by the general assembly of the state.

Porto Rico.

There is no agricultural department in the island. The experimental work is carried on by the experiment station, with money appropriated by the congress of the United States. The experiment station is controlled through the Office of Experiment Stations, Department of Agriculture, Washington, D. C. The sum appropriated is the same as that for each of the several states.

The Morrill Act was extended to the island in 1908, and an agricultural college has recently been established.

Rhode Island.

The Rhode Island State Board of Agriculture.

It was created by an act passed May 19, 1892.

The secretary is the administrative officer, and is elected by the board.

The act creating the board prescribes that, "It shall be the duty of the board to look after the agricultural interests of the state, the promotion of agriculture, and the general interests of husbandry throughout the state."

It is part of the state cabinet, and for the carrying out of the general work of the Board of Agriculture the sum of $20,000 is annually appropriated. The board has charge of nursery inspection, cattle inspection and gipsy and brown-tail moth work. Ten thousand dollars is appropriated for this. There is no special appropriation for the nursery and cattle inspection.

South Carolina.

State Department of Agriculture, Commerce and Immigration.

The administrative officer is the Commissioner of Agriculture, Commerce and Immigration. He is appointed by the governor by and with the consent of the senate and may be removed by him at any time. His term of office is four years.

The department is organized to execute the work usually done by a bureau of agriculture, a bureau of immigration and bureau of publicity. Its function is to promote agriculture, and encourage immigration and commerce.

The commissioner is a full state officer.

The funds appropriated supplied to the department vary from year to year with the needs and are provided for in the general appropriation act.

Carefully prepared statistical and descriptive publications are issued from time to time by the department, including a 600-page handbook of the Resources of South Carolina, which is annually published. The department also issues, each year, an official list of descriptions of available properties in the state. In all the publications of this department, numbering something over thirty, a number of them are in foreign languages, being used abroad. Maps of various kinds are issued.

South Dakota.

The South Dakota State Board of Agriculture.

It has been in existence since 1884, part of the time as a territorial organization, and later, when the state was admitted, as a state organization.

It is composed of a board of five men, appointed from the various parts of the state, by the governor. It has a president, vice-president and secretary, the latter officer being appointed by the governor also. The treasurer of the board is elected by the five members of the board.

The function of the organization is to manage the annual state fair, showing the resources of the state of South Dakota.

It is no part of a state cabinet.

A fixed sum per year is allowed by the state for expenses in conducting the fair and is appropriated by the state legislature annually.

Tennessee.

The Department of Agriculture.

It has been established since 1875.

It is composed of the Commissioner of Agriculture, who is appointed by the governor of the state, and two deputies, appointed by the Commissioner of Agriculture; the State Live Stock Commissioner and three assistants, all of whom are appointed by the Commissioner of Agriculture.

Its function is the holding of farmers' institutes throughout the state, and promoting the interests of the farmers, and the eradication of contagious diseases among cattle.

It is a part of the state cabinet, and bears the same relation to the state government that the agricultural department at Washington bears to the United States.

All funds are derived from appropriations made by the general assembly.

The publications issued by this department are as follows: Biennial Report, Crop Report (issued monthly), Fertilizer Bulletin (issued yearly), Feedstuff Bulletin (issued yearly), Handbook.

Texas.

The official title is the Commissioner of Agriculture.

The office was created at the 1906 session of the legislature, and the work organized September 1, 1907.

The chief administrative officer is the Commissioner of Agriculture, his term of office is for two years. He is elected by popular vote.

The function of the office is to encourage the development of agriculture, horticulture and kindred industries.

The Commissioner of Agriculture is ex-officio a member of the board of directors of the Agricultural and Mechanical College of the state.

The funds are appropriated by the legislature for biennial periods.

The state inspector of orchards and nurseries is also under the supervision of this office, and is paid out of fees.

During the year ending January, 1908, four bulletins were published by this department: No. 1, Nursery Inspection Report; No. 2, Pecans; No. 3. Proceedings of the Tenth Texas Farmers' Congress; No. 4, Corn.

Utah.

There is no board of agriculture, but the work usually included in a board of agriculture is cared for in this state by a number of state organizations. Most of these organizations have been in existence since statehood, in 1896.

The State Board of Horticulture has charge of fostering, promoting, and protecting the horticultural interests of the state, including nursery and tree inspection, and has general enforcement over the horticultural law. The board consists of five members. The governor appoints four, and their term of office is four years. The director of the Utah Experiment Station is the fifth member. It is supported entirely, and all salaries and expenses paid, by the state. Usually the appropriation for this department amounts to about $4,000 per year.

The State Board of Horse Commissioners, organized in 1907, has charge of the registration and regulation of breeding horses. It gets no direct state appropriation, but has all registration fees to defray expenses. The board is made up of the professor of animal industry and professor of veterinary science of the State Agricultural College.

There is also a State Board of Veterinary Medical Examiners, who regulate the practice of veterinary medicines in the state.

The State Food and Dairy Commissioner is appointed by the governor, and has a direct appropriation for carrying on his work. He has charge of inspecting dairy products, meats, and provisions, and the like.

The State Fair Association has charge of the holding of annual fairs, receives a direct appropriation from the state, as well as all moneys that are made at the fair. The members are appointed by the governor.

There is also a State Board of Sheep Commissioners. They have charge of the sheep inspection, with an idea of controlling and suppressing scab and other infectious diseases.

The farmers' institute work is in charge of the Superintendent of Farmers' Institutes, under the direction of the trustees of the State Agricultural College. A special fund is provided for this work.

Vermont.

Vermont Board of Agriculture.

It has been established since 1872.

The chief administrative officer is the secretary, who is chosen by the board. The Governor, the President of the University of Vermont and the State Agricultural College, and three other persons appointed by the governor, and confirmed by the senate during each biennial session of the general assembly, and who hold office for a term of two years, constitute the Board of Agriculture.

The function of the board is the improvement of the general interests of husbandry and the promotion of agricultural education throughout the state.

The funds are derived from semi-annnal appropriations by the state.

Virginia.

The Department of Agriculture and Immigration of Virginia.

The State Board of Agriculture was established in 1888.

Its function is to promote the agricultural interests of the state.

The Commissioner of Agriculture is the administrative officer. He is chosen by popular vote.

It is one of the state departments.

The department is supported by a fund derived from the sale of a fertilizer tax tag.

Washington.

Under the law of Washington, the Secretary of State is made Commissioner of Statistics and Agriculture.

The Secretary of State is the administrative officer and he is placed at the head of that department by an act of the legislature.

The function of the department is more particularly to look after the statistical work in the state.

The Secretary of State has nothing to do with the regular state government, nor is he a part of the state cabinet.

He has funds at his disposal for specific purposes voted by an act of the legislature.

West Virginia.

The State Board of Agriculture.

It has been in existence since 1891.

Its organization is purely for the advancement of agriculture. The administrative officer is the secretary, who is elected by the board for a term of two years.

It was organized to devise ways and means of promoting the agricultural interests of the state by every legitimate means.

The board is appointed by the governor.

It is in no way a part of the state cabinet.

The legislature makes an appropriation of $15,000 per annum to pay all expenses likely to be incurred by the board, including farmers' institutes and $2,500 to $4,000 per annum for the control of contagious diseases affecting domestic animals.

The secretary publishes a quarterly report of the practical and experimental information along agricultural and horticultural lines, and a biennial report to the governor.

Wisconsin.

The agricultural department is termed the Wisconsin State Board of Agriculture.

In its present form it has been in existence since 1897; previous to that time the work was carried on by an organization called the Wisconsin State Agricultural Society.

The board, consisting of thirteen members—two from the state at large, and one from each congressional district—is appointed by the governor, each member serving three years, and not more than two-thirds of the members of the board can be of one political party.

The organization arranges for and holds the annual fair of the state. It also, through its secretary, publishes an annual report concerning the work of the board, and giving a stenographic report of the convention, held for the discussion of topics in February of every year. The secretary also conducts a system of crop reporting for the state, and he may be termed the administrator of affairs of the board. He is chosen by the board at the annual meeting each year.

The state gives an annual appropriation and the legislature has, from time to time, made liberal appropriations for the purpose of placing proper buildings upon the state fair grounds, but the actual revenue, aside from the regular appropriations, is obtained from the proceeds of the annual fair.

The publications of the board are an annual report containing the transactions of the board and a full report of a convention held for addresses and discussion of the same, and a monthly crop report in bulletin form giving the condition of the principal farm crops.

Wyoming.

There is no regular organized state department of agriculture, as all agriculture of any magnitude depends upon irrigation. The State Engineer and the Board of Control, of which he is president, has charge of the water of the state. The title is Engineer's Office, State of Wyoming.

The office has been in existence for eighteen years.

The state engineer and division superintendents are appointed by the governor.

The legislature makes appropriations every two years for carrying on the work entrusted to these officers. The cost of this supervision averages from $15,000 to $20,000 per year.

IN CANADA

Alberta.

The Department of Agriculture.

It has been in existence since September 1, 1905, when the province was formed.

The department consists of the Minister of Agriculture, Deputy Minister, Chief Clerk and Accountant and the following branches: Office of the Dairy Commissioner; Superintendent of Fairs and Institutes; Chief Inspector of Noxious Weeds; Chief Game and Fire Guardian; Poultry Superintendent; and Recorder of Brands. Moreover, the department has also the supervision of public health matters, there being a Provincial Health Officer and a Sanitary Engineer who devotes his whole time to the supervision of the installation of water and sewerage works throughout the province. There is a bacteriological laboratory owned by the province for the use of these two officers.

The administrative officer is the Minister of Agriculture and under him the Deputy Minister. The Minister of Agriculture is a member of the provincial parliament elected by the people and chosen by the Premier as a suitable man for the position. The Deputy is not elected by the people.

The department is a part of the provincial government and its head is a member of the provincial cabinet or executive council.

The funds at the disposal of the department are derived from the general revenue of the province, which in a large measure consists of subsidies from the Dominion or federal government.

British Columbia.

The official title of the department of agriculture for the province is the Department of Agriculture.

It has been in existence since 1894.

The nature of the organization is the Minister of Finance and Agriculture, elected by the people, and chosen by the Premier as one of his cabinet. The Deputy Minister of Agriculture is chosen by the Minister and government.

The functions and powers of the Minister are as follows: He has, throughout the province, the control and management of everything connected with the Department of Agriculture; he has control of and supervision over agricultural schools or colleges, model farms, and all agricultural, horticultural and dairying associations and societies, and institutions for teaching agriculture, receiving government aid; and also of and over boards of horticulture, the inspector of contagious diseases of animals, and other officers having control of any public office in connection with agricultural, horticultural and pastoral industries, or allied subjects of the province; and all such officers make annual reports to the Ministry.

The Department of Agriculture is one branch of the provincial government, and the Minister of the Department is a cabinet member.

The funds that are at this department's disposal are voted by the government in the supply bills.

Manitoba.

The Department of Agriculture and Immigration.

The Minister of Agriculture is the administrative officer and has charge of all matters pertaining to agriculture and immigration.

The function of the department is the advancement of agriculture along all the higher and most scientific lines, as well as the financing and control of all its departments.

It is administered in the cabinet by the Minister of Agriculture who is appointed by the premier, appointed or called by the lieutenant-governor.

Its funds are provided by the legislature upon request of the Minister of Agriculture to meet the demands of current circumstances annually.

New Brunswick, Canada.

Department of Agriculture.

The department was organized in 1897.

The Commissioner of Agriculture, who is one of the members of the government elected by the people. There are, in addition, a deputy commissioner and two dairy superintendents.

Its purpose is to further agricultural interests in all branches.

It is one of the departments of the government service.

The funds are derived from the general revenue of the province. The expenditures are along the following lines: Grants to societies, Department of Agriculture, butter and cheese factories, encouragement of dairying, dairy school, farmers' institutes, insurance exhibition buildings, Maritime Stock Breeders Association, illustration orchards, cold storage, exhibitions, assistance to scholars from New Brunswick attending agricultural colleges.

The publication of the department is an Agricultural Report containing reports on weather conditions, crop reports, cheese- and butter-production in factories and general information.

Nova Scotia.

The Department of Agriculture.

The first act providing for the encouragement of agriculture was passed in 1845. This act provided for a Central Board of Agriculture, under whose direction the agricultural affairs of the province were managed until 1885. The present organization was established in 1885.

The Department of Agriculture is presided over by the Provincial Secretary (the Premier of the province). The administrative officer is the Secretary of Agriculture, who is appointed by the governor and council.

The function of the department is the encouragement of agriculture through agricultural societies and associations, exhibitions (county and provincial), the agricultural college, local experiment stations and various publications.

The affairs of the department are administered by the Secretary of Agriculture, whose appointment is non-political and continuous. He is required to submit an annual report of his administration, to be laid before the legislature, where it is discussed by the various members. The secretary is, naturally, guided in his administration by the character of the public discussion, but other than this, is not in any way a part of the government.

The Secretary of Agriculture prepares his estimates, which are submitted to the legislature and required to be passed by this body before funds are granted.

The department issues an annual report containing a report of the work of and the experiments carried on by the various departments. It also includes popular instructive articles on different phases of farming. Popular bulletins and press articles are frequently issued.

Ontario.

The Department of Agriculture of the Province of Ontario.

The department was established in 1888.

The department is administered by a member of the Executive Council or Cabinet, who holds the office of Minister of Agriculture. The Executive Council is appointed by the lieutenant-governor on the recommendation of the Prime Minister, and consists of members of the provincial legislature, an elective body. Each member of the council represents a constituency in the legislature.

The function of the department is to collect information, including statistics, relating to agriculture, and to adopt measures for disseminating and publishing the same; to secure the enactment of such laws as are deemed necessary for the welfare of the agricultural community in so far as they come within the jurisdiction of the province, and to administer same where authorized so to do.

The funds at the disposal of the department are voted annually by the legislature from the public revenue on the recommendation of the minister, there is no direct taxation.

The publications of the department are the annual reports of the Ontario Agricultural College and Experimental Farm, Experimental Union, Farmers' Institute, Women's Institute; of the Dairymen's, Fruit Growers', Live Stock, Vegetable Growers' Associations; of the Agricultural and Horticultural Societies; agricultural and municipal statistics; also crop bulletins and agricultural college bulletins.

Prince Edward Island.

Department of Agriculture.

The department was established in 1901.

The chief executive officer is the Commissioner of Agriculture, who is at the same time Provincial Secretary-Treasurer. He is appointed by the governor from the members of the legislature and confirmed by popular vote.

The department was organized to administer the agricultural affairs of the province, and the moneys granted by the legislature from time to time for the encouragement and dissemination of agricultural information. More specifically, the duties of the commissioner are: To take measures for the formation of societies throughout the province; to receive the accounts and reports of such societies; to take measures to obtain from other countries animals of new and approved breeds, new varieties of grains, seeds and vegetables, and other agricultural products for general and equitable distribution in the several districts; and to adopt practicable measures generally to promote improvement in stock-raising, dairying, horticulture and other branches of agriculture.

The Commissioner of Agriculture is a member of the cabinet.

A sum of money is annually appropriated by the legislature for agricultural purposes.

The only publications issued by the department are the annual report and the crop report.

Quebec.

The Department of Agriculture of the province of Quebec.

It was at first, in 1867, the Department of Agriculture and Public Works; it became, in 1888, the Department of Agriculture and Colonization by a proclamation issued in virtue of a law adopted in 1887. Since 1897, it has been known as the Department of Agriculture.

The Minister of Agriculture, a member of the cabinet, has the administration of the department. He has, throughout the province, the control of everything connected with agriculture: Agricultural schools, dairy schools, model farms, agricultural and horticultural societies, farmers' clubs, the Council of Agriculture and similar organizations. All the programs of the agricultural societies and farmers' clubs must be approved by the Minister. The staff of the department is composed of the Deputy Minister, a secretary of the department, an accountant, a secretary of the Council of Agriculture, lecturers and other special officers, including an engineer for the improvement of public roads. The Deputy Minister, subject to the control of the Minister, has the general management of the business of the department.

The department has been organized with a view of promoting the progress of agriculture.

For the year 1908–1909, the sum of $261,300 was placed at the disposal of the Minister of Agriculture and has been voted by the legislature of the province of Quebec. The appropriations thus voted are: Farmers' clubs, $60,600; agricultural societies, $50,000; agricultural schools, $17,500; dairymen's association, $2,000; dairy school at St. Hyacinthe, $5,500; butter and cheese syndicates and inspection of the same, $28,000; encouragement of the dairy industry, $15,000; other grants, $82,700.

Saskatchewan.

The Department of Agriculture.

The department was organized in 1898. Previous to that time some of the functions now exercised by it were performed by other departments of the public service. Settlement of the country was so sparse in the years previous to 1898 and the funds at the disposal of the government of the Northwest Territories, as this country was then known, were so limited that it was not considered advisable or possible to make any considerable expenditure in aid of the different branches of agriculture that now receive assistance.

The officer in charge of the department is known as the Commissioner of Agriculture, and he is responsible as a member of the government to the country. Responsible to the Commissioner and representing him in the administration of the department is his deputy. At the head of each branch of the department and reporting through the deputy to the commissioner is a specialist in his particular work.

The chief functions of the department are agricultural; and these may be sub-divided into two main classes—the administration of statutes affecting the agricultural interests of the country, and the furthering of the farmers' interests by whatever other means it may be possible, educational or otherwise.

The Commissioner of Agriculture is a member of the provincial government and holds a seat in the legislative assembly.

The funds at the disposal of the department are voted annually by the legislative assembly.

The publications of the department include crop reports and reports as to the various resources of the province.

AMERICAN AGRICULTURAL SOCIETIES

An effort is here made to prepare a record of all agricultural societies in Canada and the United States of greater scope than county organizations. It cannot be expected that the list is complete, but every effort has been made to secure the names of all the societies devoted to general agriculture, fruit-growing, floriculture, bee-keeping, stock-raising, dairying, forestry, irrigation, agricultural education, and the like. These entries have been secured from a very extensive direct correspondence extending over many months. Effort has been made to secure the following facts in each case: Exact name of society; name and address of present secretary; date of organization and incorporation. Officers of many of these societies are frequently changing and the time of election varies throughout the year, so that it is impossible for any record to be perfectly accurate at any time. The present roster may be considered to be founded on the status for the years 1907 and 1908.

I. UNITED STATES

BEE-KEEPERS

Arkansas Valley Honey Producers' Association. A. Lehman, Rocky Ford, Col.

National Bee-Keepers' Association. W. Z. Hutchinson, Flint, Mich.

Southern Beekeepers' Association. Judson Heard, Macon, Ga.

Western Honey Producers' Association. March, 1906. (Includes Nebraska, South Dakota, Minnesota and Iowa.) Edw. G. Brown, Sergeant Bluff, Iowa.

DAIRY

Boston Coöperative Milk Producers' Association. W. A. Hunter, 10 Florence Street, Worcester, Mass.

Columbia River Dairy Association. H. T. French, Moscow, Idaho.

Five States Milk Producers' Association. H. T. Coon, Little York, N. Y.

National Association of Dairy Instructors and Investigators. C. B. Lane, United States Department of Agriculture, Washington, D. C.

National Creamery Buttermakers' Association. E. Sudendorf, Elgin, Ill.

National Dairy Union. Charles Y. Knight, 188 South Water Street, Chicago, Ill.

New England Milk Producers' Union. L. S. Hayward, Pomfret Center, Conn.

FOREST AND WATER

American Forestry Association. H. M. Suter, Washington, D. C.

Franklin Forestry Association. W. G. Bowers, Chambersburg, Pa.

International Society of Arboriculture. J. P. Brown, Connersville, Ind.

Mazamas, The. Frank E. Donaldson, 264 Stark Street, Portland, Ore.

Society of American Foresters. George B. Sudworth, Washington, D. C.

Sylvator Society, The. W. W. Barrett, Bismarck, N. D.

GENERAL AGRICULTURE

American Association of Farmers' Institute Workers. John Hamilton, Department of Agriculture, Washington, D. C.

American Institute Farmers' Club. William A. Eagleston, New York, N. Y.

American Society of Agricultural Engineering. L. W. Chase, Lincoln, Neb.

Association of American Agricultural Colleges and Experiment Stations. J. L. Hills, Burlington, Vt.

Association of Official Agricultural Chemists. H. W. Wiley, Department of Agriculture, Washington, D. C.

Association of State and National Food and Dairy Departments. R. M. Allen, Lexington, Ky.

Cider and Cider-Vinegar Association of the Northwest. George Miltenberger, St. Louis, Mo.

Farmers' Educational and Coöperative Union of America. August 28, 1902. R. H. McCulloch, Beebe, Ark.

Farmers' National Congress. George M. Whitaker, Washington, D. C.

International Association of Auctioneers. August 24, 1904. L. S. Kent, Hutchinson, Kans.

National Association of Dairy and Food Departments. J. B. Noble, Hartford, Conn.

National Association of Economic Entomologists. A. F. Burgess, Reading, Mass.

National League of Commission Merchants of the United States. A. Warren Patch, Boston, Mass.

North American Society of Game Preservers. Dwight W. Huntington, Yonkers, N. Y.

Patrons of Husbandry. C. M. Freeman, Tippecanoe City, Ohio.

Planters' Protective Association of Kentucky, Tennessee and Virginia. September 24, 1904. Mrs. N. E. Greene, Guthrie, Ky.

Sierra Club. Prof. W. R. Dudley, Stanford University, California.

Tri-State Fair Association. R. M. Williams, Memphis, Tenn.

Tri-State Grain and Stock Growers' Convention. J. W. Worst (Pres.), Fargo, N. D.

Tri-State Packers' Association. C. M. Dashiell, Princess Anne, Md.

GENERAL HORTICULTURE

American Apple Growers' Congress. T. C. Wilson, Hannibal, Mo.

American Association of Nurserymen. George C. Seager, Rochester, N. Y.

American Carnation Society. Albert M. Herr, Lancaster, Pa.

American Cranberry Growers' Association. 1869. A. J. Rider, Hammonton, N. J.

American Federation of Horticultural Societies. Charles E. Bassett, Fennville, Mich.

American Institute, Horticultural Section. Leonard Barron, New York City.

American Nurserymen's Protective Association. Thomas B. Meehan, Dreshertown, Pa.

American Pomological Society. John Craig, Ithaca, N. Y.

American Retail Nurserymen's Protective Association. Guy A. Bryant, Princeton, Ill.

American Rose Society. March 13, 1899. Benjamin Hammond, Fishkill-on-Hudson, N. Y.

Chrysanthemum Society of America. David Fraser, Pittsburgh, Pa.

Eastern Nurserymen's Association. Wm. Pitkin, Rochester, N. Y.

International Apple Shippers' Association. A. Warren Patch, Boston, Mass.

Mississippi Valley Apple Growers' Association. James Handly, Quincy, Ill.

Missouri Valley Horticultural Society. A. V. Wilson, Muncie, Kans.

National Association of Retail Nurserymen. F. E. Grover, Rochester, N. Y.

National Nutgrowers' Association. J. F. Wilson, Poulan, Ga.

Northwest Fruit Growers' Association. E. R. Lake, Corvallis, Ore.

Nurserymen's Mutual Protective Association. George C. Seager, Rochester, N. Y.

Pacific Coast Association of Nurserymen. C. A. Tonneson, Tacoma, Wash.

Peninsula Horticultural Society. Wesley Webb, Dover, Del.

Society of American Florists and Ornamental Horticulturists. William J. Stewart, Boston, Mass.

Southern Nurserymen's Association. A. I. Smith, Knoxville, Tenn.

Southwestern Nurserymen's Association. J. A. Taylor, Wynnewood, Indian Territory.

Western Association of Nurserymen. E. J. Holman, Leavenworth, Kans.

Western Association of Wholesale Nurserymen. U. B. Pearsall, Leavenworth, Kans.

LIVE-STOCK

Cattle.

American Aberdeen-Angus Breeders' Association. Charles Gray, Pedigree Record Building, Union Stock Yards, Chicago, Ill.

American Branch Association of the North Holland Herd Book. N. F. Sliniter, Brooklyn, N. Y.

American Devon Cattle Club. L. P. Sisson, Newark, Ohio.

American Galloway Breeders' Association. R. W. Brown, Pedigree Record Building, Union Stock Yards, Chicago.

American Guernsey Cattle Club. W. H. Caldwell, Peterboro, N. H.

American Hereford Cattle Breeders' Association. C. R. Thomas, Kansas City, Mo.

American Jersey Cattle Club. J. J. Hemingway, 8 West Seventeenth street, New York.

American Normandy Herd Book Association. E. G. Kramer, New York, N. Y.

American Polled Hereford Breeders' Association. July, 1900. Warren Gammon, Des Moines, Iowa.

American Shorthorn Breeders' Association. John W. Groves, Pedigree Record Building, Union Stock Yards, Chicago, Ill.

American Simmenthal Herd Book Association. E. G. Kramer, New York, N. Y.

American Sussex Breeders' Association. Overton Lea, Nashville, Tenn.

Ayrshire Breeders' Association. C. M. Winslow, Brandon, Vt.

Breeders' Association of French-Canadian Cattle of the United States. W. J. McMurdy, Binghamton, N. Y.

Brown Swiss Cattle Breeders' Association. Charles D. Nixon, Owego, N. Y.

Dutch Belted Cattle Association of America. H. B. Richards, Easton, Pa.

Guernsey Breeders' Association. E. B. Sharpless, Avondale, Pa.

Holstein-Friesian Association of America. F. L. Houghton, Brattleboro, Vt.

National Polled Hereford Breeders' Association. A. E. White, 5629 Madison avenue, Chicago, Ill.

New England Holstein-Friesian Club, The. C. W. Wolcott, Exchange Building, Boston, Mass.

Polled Durham Breeders' Association. J. H. Martz, Greenville, Ohio.

Red Polled Cattle Club of America (incorporated). Harley A. Martin, Gotham, Wis.

Horses.

American Association of Importers and Breeders of Belgian Draft Horses. J. D. Conner, Jr., Wabash, Ind.

American Breeders' Association of Jacks and Jennets. J. W. Jones, Columbia, Tenn.

American Breeders' and Importers' Percheron Registry. John A. Forney, Plainfield, Ohio.

American Clydesdale Association. R. B. Ogilvie, Union Stock Yards, Chicago, Ill.

American Hackney Horse Society. Gurney C. Gue, New York, N. Y.

American Saddle Horse Breeders' Association. I. B. Nall, Louisville, Ky.

American Shetland Pony Club. Mortimer Levering, Lafayette, Ind.

American Shire Horse Breeders' Association. Charles Burgess, Wenona, Ill.

American Stud Book (Thoroughbreds). W. H. Rowe, Registrar, New York.

American Suffolk Horse Association. Alexander Galbraith, Janesville, Wis.

American Trotting Register Company. Frank E. Best, Registrar, Chicago, Ill.

Cleveland Bay Society of America. R. P. Stericker, West Orange, N. J.

French Coach Horse Society of America. Duncan E. Willett, Oak Park, Ill.

French Coach Registry Company. Charles C. Glenn, Columbus, Ohio.

German Hanoverian and Oldenburg Coach Horse Breeders' Association. J. Crouch, Lafayette, Ind.

Morgan Horse Register. Joseph Battell, Middlebury, Vt.

National French Draft Horse Association. C. E. Stubbs, Fairfield, Iowa.

Oldenburg Coach Horse Association of America. C. E. Stubbs, Fairfield, Iowa.

Percheron Registry Company. Charles C. Glenn, Columbus, Ohio.

Percheron Society of America. George W. Stubblefield, Union Stock Yards, Chicago, Ill.

Select Clydesdale Horse Society of America. Charles Irwin, Topeka, Kans.

Sheep and Goats.

American Angora Goat Breeders' Association. John W. Fulton, Helena, Mont.

American Cheviot Sheep Society. F. E. Dawley, Fayetteville, N. Y.

American Continental Dorset Horn Club. 1898. J. E. Wing, Mechanicsburg, Ohio.

American Cotswold Association. Frank W. Harding, Waukesha, Wis.

American and Delaine Merino Record Association. S. M. Cleaver, Delaware, Ohio.

American Leicester Breeders' Association. 1888. A. J. Temple, Cameron, Ill.

American Merino Sheep Register. R. O. Logan, California, Mich.

American Milch Goat Record Association. W. A. Shafor, Hamilton, Ohio.

American Oxford Down Association. 1882. W. A. Shafor, Hamilton, Ohio.

American Rambouillet Sheep-Breeders' Association. 1889. Dwight Lincoln, Milford Center, Ohio.

American Shropshire Registry Association. Mortimer Levering, Lafayette, Ind.

American Southdown Breeders' Association. 1883. Frank S. Springer, Springfield, Ill.

American Suffolk Flock Registry Association. 1892. Geo. W. Franklin, Des Moines, Iowa.

American Tunis Sheep-Breeders' Association. Charles Rountree, Crawfordsville, Ind.

Black-Top Spanish Merino Sheep-Breeders' Publishing Association. R. P. Berry, Clokey, Pa.

Delaine Merino Sheep Breeders' Association. J. C. McNary, Houstonville, Pa.

Dickinson Merino Sheep Record Company. Beulah McDowell, Canton, Ohio.

Dorset Horn Breeders' Association of America. 1891. M. A. Cooper, Washington, Pa.

Franco-American Merino Sheep-Breeders' Association. John P. Ray, Hemlock, N. Y.

Hampshire Down Breeders' Association of America. 1889. C. A. Tyler, Nottawa, Mich.

Improved Black-Top Delaine Merino Sheep-Breeders' Association. O. M. Robertson, Eaton Rapids, Mich.

International von Homeyer Rambouillet Club. E. M. Moore, Orchard Lake, Mich.

Michigan Merino Sheep-Breeders' Association. E. N. Ball, Hamburg, Mich.

National Cheviot Sheep Society. 1894. H. H. Kelm, Ladoga, Ind.

National Improved Saxony Sheep Breeders' Association. John G. Clarke, R. D. 9., Washington, Pa.

National Lincoln Sheep-Breeders' Association. 1891. Bert Smith, Charlotte, Mich.

National Merino Sheep Register Association. R. O. Logan, Montgomery, Mich.

National Shropshire Record Association. S. J. Weber, Middleville, Mich.

New York State American Merino Sheep-Breeders' Association. J. Horatio Earll, Skaneateles, N. Y.

Ohio Merino Sheep-Breeders' Association. Wesley Bishop, Troyton, Ohio.

Persian Sheep Breeders' Association. C. E. Bailey, San José, Cal.

Standard American Merino Sheep Breeders' Association. John P. Ray, Hemlock, N. Y.

Standard Delaine Spanish Merino Sheep Breeders' Association. S. M. Cleaver, East Bethlehem, Pa.

United States Merino Sheep Registry Association. J. A. B. Walker, Mount Airy, Pa.

Vermont Merino Sheep-Breeders' Association. C. A. Chapman, Ferrisburgh, Vt.

Swine.

American Berkshire Association. 1875. Frank S. Springer, Springfield, Ill.

American Chester White Record Association. 1884. Ernst Freigan, Dayton, Ohio.

American Duroc-Jersey Swine-Breeders' Association. 1890. T. B. Pearson, Thorntown, Ind.

American Essex Association. 1887. F. M. Stout, McLean, Ill.

American Hampshire (Thin-Rind) Swine Record Association. E. C. Stone, Armstrong, Ill.

American Poland-China Record Company. 1870. W. M. McFadden, Pedigree Record Building, Union Stock Yards, Chicago, Ill.

American Small Yorkshire Club. G. W. Harris, 3409 Third Avenue, New York City, N. Y.

American Tamworth Swine Record Association. 1897. E. N. Ball, Hamburg, Mich.

American Yorkshire Club. H. G. Krum, White Bear Lake, Minn.

Central Poland-China Association. 1880. W. H. Morris, Indianapolis, Ind.

Cheshire Swine-Breeders' Association. 1884. E. S. Hill, Freeville, N. Y.

Chester White Record Association. W. H. Morris, Indianapolis, Ind.

Improved Small Yorkshire Club of America. F. B. Stewart, Espeyville, Pa.

International Chester White Record Association.

National Berkshire Record Association. 1893.

National Chester White Record Association. Thomas Sharpless, West Chester, Pa.

National Duroc-Jersey Record Association. 1891. R. J. Evans, Elpaso, Ill.

National Duroc-Jersey Swine-Breeders' Association. H. C. Sheldon, Peoria, Ill.

National Mule Foot Hog Record Association. January, 1908. W. H. Morris, Indianapolis, Ind.

National Poland-China Record Association. A. M. Brown, Winchester, Ind.

Northwestern Poland-China Swine Association. 1881. Washington, Kans.

Northwestern Swine Growers' Association.

O. I. C. Swine Breeders' Association. J. C. Hiles, Cleveland, Ohio.

Southwestern Poland-China Record Association. H. P. Wilson, Gadsden, Tenn.

Standard Chester White Record Association. W. H. Morris, Indianapolis, Ind.

Standard Poland-China Record Company. 1887. George F. Woodworth, Maryville, Mo.

Suffolk Swine Association. W. F. Watson, Winchester, Ind.

United States Small Yorkshire Association. D. T. Bascom, California, Mich.

Victoria Swine-Breeders' Association. 1886. H. Davis, Dyer, Ind

MISCELLANEOUS

American Association of Live Stock Herd Book Secretaries. Charles F. Mills, Springfield, Ill.

American Breeders' Association. W. M. Hays, Washington, D. C.

American Kennel Club. A. P. Vredenburg, 55 Liberty street, New York, N. Y.

American National Live Stock Association. W. M. Tomlinson, Denver, Col.

Corn Belt Meat Producers' Association. H. C. Wallace, Des Moines, Iowa.

Interstate Breeders' Association. F. L. Wirick, Sioux City, Iowa.

National Wool Growers' Association. 1864. George S. Walker, Cheyenne, Wyo.

Southeastern Stockgrowers' Association. 1904. Z. C. Chambliss, Ocala, Fla.

POULTRY

American Black Minorca Club. John A. Gamewell, Hackensack, N. J.

American Buff Leghorn Club. George S. Barnes, Battle Creek, Mich.

American Buff Plymouth Rock Club. C. A. Morton, St. Louis, Mo.

American Buff Wyandotte Club. Henry R. Ingalls, Greenville, N. Y.

American Cochin Club. Arthur R. Sharp, Taunton, Mass.

American Dorking Club. F. H. Prentice, North Grafton, Mass.

American Houdan Club. Thomas F. Rigg, Iowa Falls, Iowa.

American Indian Game Club.

American Langshan Club. Rees F. Matson, Greencastle, Ind.

American Leghorn Club. W. W. Babcock, Bath, N. Y.

American Orpington Club. Dr. Paul Kyle, Flushing, L.I., N.Y.

American Plymouth Rock Club. H. P. Schwab, Irondequoit, N. Y.

American Poultry Association. 1875. Ross C. H. Hallock, St. Louis, Mo.

American White Plymouth Rock Club. Seth W. Gregory, Delavan, Wis.

American White Wyandotte Club. W. R. Graves, Springfield, Mass.

Black Hills Poultry Association. J. H. Pearson, Belle Fourche, S. D.

Blue Andalusian Club. E. L. C. Morse, 245 East 65th Place, Chicago, Ill.

Buckeye Poultry Association. Geo. B. Wetzel, Dayton, Ohio.

Canadian Barred Plymouth Rock Club. J. R. Boyce, London, Ont.

Canadian White Plymouth Rock Club. P. Dill, Seaforth, Ont.

Canadian White Wyandotte Club. J. F. Daly, Seaforth, Ont.

Cornish Indian Game Club of America. Adam Thompson, Amity, Mo.

Eastern White Wyandotte Club. W. E. Mack, Woodstock, Vt.

Fanciers' and Breeders' Association. Karl Volland, Columbus, Ind.

Illinois Valley Fanciers' Association. F. T. Todd, Peoria, Ill.

International Bantam Breeders' Club. Frank W. Radford, Oshkosh, Wis.

International Waterfowl Association. Theodore F. Jager, Rochester, N. Y.

Interstate Poultry Association. P. Horrocks, Falls City, Neb.

Mid-Continental Poultry Association. F. M. Slutz, Kansas City, Mo.

Minorca Club of Northwest. Dr. H. B. Fay, Minneapolis, Minn.

National Bantam Association. E. Latham, Flatbush, L.I., N.Y.

National Bronze Turkey Club. E. F. Pullins, Rensselaer, Ind.

National Exhibition Game and Game Bantam Club. E. J. W. Dietz, Downer's Grove, Ill.

National Fanciers' Association. Fred L. Kinney, Morgan Park, Ill.

National Poultry and Pigeon Association. George E. Howard, Washington, D. C.

National Red Feather Club. R. P. Searle, Toledo, Ohio.

National Rose Comb Rhode Island Red Club. John E. Davis, Marblehead, Mass.

National Single Comb Buff Orpington Club. Will H. Schadt, Goshen, Ind.

National Single Comb Rhode Island Red Club. J. H. Valliere, Cedar Rapids, Iowa.

National Single Comb White Leghorn Club. Irving F. Rice, Cortland, N. Y.

National White Wyandotte Club. H. P. Rankin, Hartington, Neb.

New England Light Brahma Club. G. W. Cromack, Stoneham, Mass.

New England White Wyandotte Club. Arthur G. Duston, South Framingham, Mass.

Northern Ohio Poultry and Pet Stock Association. F. R. Hunt, Cleveland, Ohio.

Ohio Valley Poultry Association. January 11, 1907.

Partridge Wyandotte Club. H. R. Hildreth, Worcester, Mass.

People's Poultry and Pet Stock Association. P. A. Hiller, Fort Wayne, Ind.

Piedmont Poultry Association. B. W. Getsinger, Spartansburg, S. C.

Rhode Island Red Club of America. E. L. Prickett, Hazardville, Conn.

Santa Clara Valley Poultry and Pet Stock Association. Charles R. Harker, San José, Cal.

Silver Penciled Wyandotte Club. G. S. Boller, Little Valley, N. Y.

Silver Wyandotte Club. Henry Steinmesch, St. Louis, Mo.

Tri-State Poultry Association. J. A. McIntosh, East Liverpool, Ohio.

Tri-State Poultry Association. J. M. Skinner, Keokuk, Iowa.

Tri-State Poultry Association. R. B. Naylor, Wheeling, W. Va.

Western Bantam Breeders' Association. A. E. Brown, Morgan Park, Ill.

Western Poultry Fanciers' Association. O. W. Ilten, Cedar Rapids, Iowa.

White River Poultry and Pet Stock Association. S. A. Medcalf, Petersburg, Ind.

STATE SOCIETIES

Alabama.

Alabama Dairy Association. Frank Bates, Hamburg.

Alabama Livestock Sanitary Board. March 27, 1907. Dr. C. A. Cary, Auburn.

Alabama State Board of Horticulture. Prof. R. S. Mackintosh, Auburn.

Alabama State Horticultural Society. January 27, 1903. Prof. R. S. Mackintosh, Auburn.

Alabama State Livestock Association. December, 1896. Prof. D. T. Gray, Auburn.

Cuba Vegetable Growers' Association. Cuba.

German Farmers' Association. Cullman.

Independent Shippers' Association. Cullman.

Madison County Cantaloupe Association. Huntsville.

Arizona.

Arizona Cattle Growers' Association. Cris. Ellerbe, Tombstone.

Arizona Honey Exchange. William Rohrig, Tempe.

Arizona Live Stock Sanitary Commission. H. Harrison, Phoenix.

Arizona State Association of Beekeepers. William Rohrig, Tempe.

Mesa Cantaloupe Growers' Association. Mesa.
Phoenix Cantaloupe Growers' Association. Phoenix.

Arkansas.

Arkansas State Horticultural Society. W. K. Tipton, Little Rock.
Judsonia Strawberry Growers' Association. Judsonia.

California.

Brawley Cantaloupe Association. Brawley.
California Citrus League. Los Angeles.
California Citrus Union. Los Angeles.
California Colony Association.
California Fruit Growers' Association. H. G. Boyce, Winter.
California Fruit Growers' Exchange. B. A. Woodford, Los Angeles.
California National Honey Producers' Association. H. J. Mercer, Los Angeles.
California Society for Conserving the Waters and Forests. E. H. Benjamin, San Francisco.
California State Agricultural Society. J. A. Filcher, Sacramento.
California State Association of Beekeepers. E. A. Honey, Orange.
California State Floral Society. Mrs. H. P. Tricon, San Francisco.
California Vegetable Union. Los Angeles.
Central California Beekeepers' Association. F. E. Brown, Hanford.
Forest and Water Society of Southern California. William H. Knight, Los Angeles.
Holtville Cantaloupe Growers' Association. Holtville.
Interurban Fruit and Vegetable Association. Imperial.
Northern California Bee Keepers' Association. B. B. Hogaboom, Elk Grove.
Pajaro Valley Orchardists' Association. S. W. Coffman.
Pomological Society of California. G. H. A. Goodwin, Los Angeles.
Poultry Breeders' Association of Southern California. December 20, 1907. H. W. Meserve, Department 3, Court House, Los Angeles.
Yuma Valley Produce Growers' Association. Coachella.

Colorado.

Agricultural Club. L. C. Aicher, Agricultural College, Fort Collins.
Arkansas Valley Honey Producers' Association. A. Lehman, Rocky Ford.
Boulder Dairymen's Association. B. G. D. Bishopp, Denver.
Colorado Cattle and Horse Growers' Association. Fred. P. Johnson, Denver.
Colorado Forestry Association. D. W. Working, Denver.
Colorado Fruit Growers' Association. W. P. Dale, Delta.
Colorado Grain and Seed Growers' Association, Fort Collins.
Colorado Hereford Breeders' Association. T. S. Dewit, Colorado Springs.
Colorado Honey Producers' Association. Frank Rauchfuss (president), Denver.
Colorado State Beekeepers' Association. Inc. 1888. N. T. Henthorn, Platteville.
Colorado State Board of Horticulture. Mrs. M. A. Shute, Denver.
Colorado State Dairymen's Association. B. G. D. Bishopp, Denver.
Colorado State Fair Association. A. G. Watson, Pueblo.
Colorado State Horticultural Society. W. S. Osborn, Denver.
Colorado State Poultry Association. G. W. Veditz, Colorado Springs.
Colorado State Veterinary Sanitary Board. B. H. DuBois, Denver.
Colorado Veterinary Medical Association. Denver.
Denver Beekeepers' Association. H. Rauchfuss, Aurora.
Denver Interstate Fair and Exposition Association. G. C. Fuller, Denver.
Fruita Fruit and Produce Association. Fruita.
Grand Junction Fruit Growers' Association. Palisades.
Grand Valley Fruit and Produce Association. Grand Junction.
Independent Fruit Growers' Association. Palisades.
Kouns Party Cantaloupe Growers' Association. Rocky Ford.
LaJunta Melon and Produce Association. LaJunta.
Manzanola Fruit Association. Manzanola.
Northern Colorado Fair Association. February 15, 1908. W. F. Crossley, Fort Collins.
Ordway Cantaloupe Growers' Association. Ordway.
Palisades Fruit Growers' Association. Palisades.
Rocky Ford Melon Growers' Association. Rocky Ford.
Western Slope Horticultural Society. February, 1906. Clinton Oliver, Grand Junction.

Connecticut.

Connecticut Audubon Society. Mrs. William B. Glover, Fairfield.
Connecticut Beekeepers' Association. May 13, 1891. James A. Smith, Hartford.
Connecticut Board of Commissioners on Diseases of Domestic Animals. Geo. L. Fosket, Winsted.
Connecticut Creamery Association. January, 1890. E. B. Little, Somers.
Connecticut Dairymen's Association. Org., 1882; inc., 1889. J. G. Schwink, Jr., Meriden.
Connecticut Farmers' Club. 1875. J. Frank Elwood, Greens Farms.
Connecticut Forestry Association. F. H. Stadtmueller, Elmwood.
Connecticut Horticultural Society. Inc., May, 1889. Alex. Cumming, Jr., Hartford.
Connecticut Jersey Cattle Breeders' Association. February 2, 1888. Robert A. Potter, Bristol.
Connecticut Milch Goat Keepers' Association. June 24, 1908. Alfred Dixon, West Hartford.
Connecticut Nurserymen's Association. J. Vidburne, Hartford.
Connecticut Plant Breeders' Association. November 8, 1906. C. D. Jarvis, Storrs.
Connecticut Pomological Society. December 15, 1891. H. C. C. Miles, Milford.
Connecticut Poultry Association. Harrison L. Hamilton, Ellington.
Connecticut Sheep Breeders' Association. Burton C. Patterson, Torrington.
Connecticut State Agricultural Society. B. W. Collins, Meriden.
Connecticut State Board of Agriculture. 1866. James F. Brown, North Stonington.
Connecticut State Grange. Patrons of Husbandry. Henry E. Loomis, Glastonbury.

Delaware.

Delaware State Corn Breeders' Association. Prof. A. E. Grantham, Newark.
Delaware State Grange. March 2, 1875. Wesley Webb, Dover.
Peninsula Horticultural Society. October 21, 1886. Wesley Webb, Dover.

Florida.

Associated Tomato Growers. Lemon City.
Dania Vegetable Growers' Union. Dania.
Florida Fruit and Vegetable Shippers' Protective Association. February, 1907. J. C. Chase, Jacksonville.
Florida Good Roads Association. A. S. Mann, Jacksonville.
Florida Live Stock Association. J. A. Hollman, Jacksonville.
Florida Orange Growers' Company. R. H. Peacock, Winterhaven, Polk county.

Florida State Fair Association.
Florida State Farmers' Institutes. P. H. Rolfs, Gainesville.
Florida State Horticultural Society. E. O. Painter, Jacksonville.
Indian River and Lake Worth Pineapple Growers' Association. Cocoa.
Indian River Narrows Fruit and Vegetable Association. Vero.
Pasadena Farmers' Club. Mrs. C. F. Gardner, Dade City
Pinellas Fruit Growers' Association.
Sanford Celery Union. Sanford.
St. John's River Fruit Growers' Association. Nov. 19, 1906. T. E. Arnold, De Land.
West Florida Agricultural Society. July, 1899. C. K. McQuarrie, De Funiak Springs.
West Florida Fair Association. R. W. Storrs, De Funiak Springs.

Georgia.

Albany Melon Growers' Association. Albany.
Farmers' Educational and Coöperative Union. W. H. McDaniel, Union City.
Georgia Dairy and Live Stock Association. Formed in 1905 by combining the Georgia Dairymen's Association (1894) and the Georgia Live Stock Breeders' Association (1903). C. L. Willoughby, Experiment.
Georgia Farmers' Union. R. F. Duckworth, Union City.
Georgia Peach Growers' Association. H. A. Mathers (president), Fort Valley.
Georgia State Agricultural Society. Martin V. Calvin, Experiment.
Georgia State Horticultural Society. 1876. J. B. Wight, Cairo.
Southern Georgia Fruit Growers' Association. W. P. Wallace, Americus.

Hawaii.

Farmers' Institute of Hawaii. Wm. Weinrick, Jr., Honolulu.
Hawaiian Bee-Keepers' Association. D. L. Van Dine, Honolulu.
Hawaiian Chemical Society. S. S. Peck, Honolulu.
Hawaiian Entomological Society. Jacob Kotinsky, Honolulu.
Hawaiian Kennel Club. C. L. Crabbe, Honolulu.
Hawaiian Live Stock Breeders' Association. Zeno K. Myres, Honolulu.
Hawaiian Pineapple Growers' Association. T. H. Petrie, Honolulu.
Hawaiian Poultry Association. J. J. Greene, Honolulu.
Hawaiian Sugar Planters' Association. W. O. Smith, Honolulu.

Idaho.

Bingham and Fremont County Bee Keepers' Association. Doctor Miller, Idaho Falls.
Boise-Payette Fruit Growers' Union. H. W. Dorman, Caldwell.
Clearwater Fruit Growers' Association. February 15, 1908. Theo. P. Tollefson, Stites.
Idaho State Association of Beekeepers. W. E. Builder, Caldwell.
Idaho State Board of Dairy, Pure Food and Oil Commissioners. 1902. Alex. McPherson.
Idaho State Board of Horticultural Inspection. 1894. A. McPherson, Twin Falls.
Idaho State Dairy Association. March, 1899. A. E. Gipson, Caldwell.
Idaho State Horticultural Association. 1890. F. E. Price, Payette.
Intermountain Fair Association. Boise.
Payette-Boise Water Users' Association, Ltd. September 9, 1904. Walter Griffiths. Caldwell.
Payette Valley Apple Growers' Union. J. A. Bower (President), Payette.
Payette Valley Poultry and Pet Stock Association. 1907. C. E. Dibble, Payette.
South Idaho and East Oregon Bee Keepers' Association. E. F. Atwater, Meridian.
Southern Idaho Fruit Growers' Association. 1907. Henry V. Price, Payette.
Southern Idaho Fruit Shippers' Association. C. J. Sincel, Boise.
Twin Falls Canal Association. January 4, 1908. Irving R. Darrow, Twin Falls.

Illinois.

Chicago Northwestern Beekeepers' Association. September 1, 1898. Herman F. Moore, Park Ridge.
Eastern Illinois and Western Indiana Beekeepers' Association. Ray Ensinger, Kankakee.
Horticultural Society of Central Illinois. J. B. Burrows, Decatur.
Horticultural Society of Northern Illinois. Jacob Friend, Nekoma.
Horticultural Society of Southern Illinois. E. G. Mendenhall, Kinmundy.
Illinois Board of Live Stock Commissioners. C. P. Johnson, Springfield.
Illinois Corn Growers' Association. Leigh F. Maxcy, Curran, Illinois.
Illinois Corn Growers' and Stockmen's Convention. J. H. Martin, Morrison.
Illinois Live Stock Breeders' Association. Fred. H. Rankin, Urbana.
Illinois State Bee Keepers' Association. 1890. James A. Stone, Route 4, Springfield.
Illinois State Board of Agriculture. J. K. Dickirson, Springfield.
Illinois State Corn Breeders' Association. John R. Clisby, Arcola.
Illinois State Dairymen's Convention. George Caven, 154 Lake street, Chicago.
Illinois State Farmers' Institute. H. A. McKeene, Springfield.
Illinois State Florists' Association. Inc., March 20, 1905. J. F. Ammann, Edwardsville.
Illinois State Grange. Jeannett E. Yates, Dunlap.
Illinois State Horticultural Society. December, 1856. W. B. Lloyd, Kinmundy.
Illinois State Poultry Association. A. L. Moore, Normal.
Northern Illinois Poultry Association. December 20, 1907. E. L. Robertson, Belvidere.
Northern Illinois and Southern Wisconsin Beekeepers' Association. B. Kennedy, Cherry Valley.
Western Illinois Beekeepers' Association. Geo. W. Cave, Kirkwood.

Indiana.

Boys' Corn Growing Club. F. A. Carson, Fowler.
Fanciers' Association of Indiana. William A. Stolts, Indianapolis.
Farmers Mutual Insurance Companies' Union of Indiana. H. L. Nowlin, Lawrenceburg.
Indiana Aberdeen-Angus Breeders' Association. C. W. Henderson, Lebanon.
Indiana Beekeepers' Association. Jay Smith, Vincennes.
Indiana Chester White Breeders' Association. F. E. Moore, Rochester.
Indiana Corn Growers' Association. Organized, January, 1900; incorporated, November 14, 1907. G. I. Christie, Lafayette.
Indiana Duroc-Jersey Breeders' Association. J. D. Nidlinger, Decatur.
Indiana Farmers' Institute. 1889. W. C. Latta (Superintendent), Lafayette.
Indiana Forestry Association. J. P. Brown, Connersville.
Indiana Grain Dealers' Association.

Indiana Hereford Breeders' Association. A. C. Huxley, Bunker Hill.

Indiana Horticultural Society. Org., 1842; reorganized, 1865: inc., 1875. W. B. Flick, Lawrence.

Indiana Live Stock Breeders' Association. December 30, 1907. J. H. Skinner, Lafayette.

Indiana Millers' State Association. John Nicholson, Indianapolis.

Indiana Poland China Swine Breeders' Association. 1881. W. H. Morris, Indianapolis.

Indiana Shorthorn Breeders' Association. John Gartin, Burney.

Indiana State Board of Agriculture. Chas. Downing, Indianapolis.

Indiana State Dairy Association. H. J. Fidler, Lafayette.

Indiana State Live Stock Sanitary Commission. Mortimer Levering, Lafayette.

Indiana Swine Breeders' Association. Chas. S. Hemenway, Zionsville.

Indiana Wool Growers' Association. Howard H. Kelm, Ladoga.

Iowa.

Boyer Valley Poultry Association. G. F. Cassidy, Denison.

Corn Belt Meat Producers' Association. H. C. Wallace, Des Moines.

Iowa Corn Growers' Association. 1902. B. N. Crossley, Ames.

Iowa Dairy Cattle Improvement Association. November, 1907. H. E. Colby, Waterloo.

Iowa Good Road Association. T. H. MacDonald, Ames.

Iowa Implement Dealers' Association. E. P. Armknecht, Donnellson.

Iowa Park and Forestry Association. Wesley Greene, Des Moines.

Iowa Seed Corn Breeders' Association. 1908. L. C. Burnett, Ames.

Iowa State Aberdeen-Angus Breeders' Association. February 28, 1908. J. M. Graham, Des Moines.

Iowa State Dairy Association. W. B. Johnson, Des Moines.

Iowa State Drainage Association. W. H. Stevenson, Ames.

Iowa State Horticultural Society. Wesley Greene, Des Moines.

Iowa Thresherman's Association. James Devin, Valley Junction.

Northeastern Iowa Horticultural Society. Chas. F. Gardner, Osage.

Northwestern Iowa Horticultural Society. W. B. Chapman, Washta.

Plant Breeders' Auxiliary of the Iowa State Horticultural Society. A. T. Erwin, Ames.

Society of Iowa Florists. Wesley Greene, Des Moines.

Southeastern Iowa Horticultural Society. W. T. Richey, Albia.

Southwestern Iowa Horticultural Society. W. M. Bomberger, Harlan.

Union Poultry Association. H. C. Moore, Union.

Upper Iowa Poultry Association. John D. Reeler, Mason City.

Kansas.

Eastern Kansas Poultry Association. Mrs. J. L West, Garnett.

Forrest Park Live Stock Breeders' Association. B. A. McQuesten, Ottawa.

Improved Stock Breeders' Association of the Wheat Belt. Chas. M. Johnston, Caldwell.

Kansas Auctioneers' Association. December 14, 1899. L. S. Kent, Hutchinson.

Kansas Berkshire Breeders' Association. Chas. E. Sutton, Lawrence.

Kansas Branch of the Red Polled Cattle Club of America. January, 1904. J. E. Hinshaw, Emporia.

Kansas Corn Breeders' Association. January 1, 1907. L. E. Call, Manhattan.

Kansas Draft Horse Breeders' Association. Prof. R. J. Kinzer, Manhattan.

Kansas Duroc-Jersey Breeders' Association. M. G. Hamm, Holton.

Kansas Good Roads Association. Prof. Albert Dickens, Manhattan.

Kansas Improved Stock Breeders' Association. H. A. Heath, Topeka.

Kansas Live Stock Sanitary Commission. Taylor Riddle, Marion.

Kansas Poland China Breeders' Association. October 5, 1905. L. D. Arnold, Enterprise.

Kansas State Association of Beekeepers. December 3, 1903. O. A. Keene, Topeka.

Kansas State Board of Agriculture. F. D. Coburn, Topeka.

Kansas State Dairy Association. I. D. Graham, Topeka.

Kansas State Exposition Company. R. T. Kreipe, Topeka.

Kansas State Fair Association. A L. Sponsler, Hutchinson.

Kansas State Horticultural Society. 1867. Walter Wellhouse, Topeka.

Kansas State Poultry Association. Prof. Dyke, Lawrence.

Kansas State Swine Breeders' Association. 1890. I. D. Graham, Topeka.

Kansas State Veterinary Medical Association. Dr. Hugh S. Maxwell, Salina.

Shawnee Breeders' Association. I. D. Graham, Topeka.

Southeast Kansas Improved Stock Breeders' Association. H. E. Bachelder, Fredonia.

Kentucky.

Ashland Grange. A. H. Gilbert, Lexington.

Blue Grass Fair Association. Jouett Shouse, Lexington.

Blue Grass Poultry and Pet Stock Association. D. D. Slade, Lexington.

Burley Branch of the American Society of Equity. G. A. Brooks, Winchester.

Central Kentucky Millers' Association. 1888. John I. Logan, Shelbyville.

Dark Tobacco Planters' Protective Association. Guthrie.

Kentucky Beef Cattle Association. May 1, 1906. J. J. Hooper, Lexington.

Kentucky Berkshire Breeders' Association. W. C. Coleman, Shelbyville.

Kentucky Dairy Cattle Association. February 23, 1906. J. J. Hooper, Lexington.

Kentucky Duroc-Jersey Breeders' Association. January 15, 1908. M. W. Neal, Louisville.

Kentucky Sheep Breeders' Association. February 20, 1908. W. F. Chilton, Campbellsburg.

Kentucky Society of Florists. Fred Shultz, Louisville.

Kentucky State Dairymen's Association. J. A. Bell, Shelbyville.

Kentucky State Fair. 1902. J. W. Newman, Louisville.

Kentucky State Grange. 1871. Mrs. Mabel G. Sayre, Hebron.

Kentucky State Horticultural Society. M. F. Johnson, Louisville.

Kentucky State Poultry Association. John H. Good, Louisville.

Kentucky Swine Breeders' Association. December 15, 1906. M. W. Neal, Louisville.

Kentucky Trotting Horse Breeders' Association. Organized, 1873; incorporated, February 17, 1876. H. W. Wilson, Lexington.

Lexington Driving Club. J. L. Watkins (president), Lexington.

Market Gardeners' Association. E. F. Wetstein, Louisville.

Ohio Valley Milling Association. George H. Cox, Owensboro.

Peewee Valley Grape Growers' Association. Peewee Valley.

State Farmers' Institutes. Frankfort.

Louisiana.

Louisiana State Agricultural Society. W. H. Dalrymple, Baton Rouge.
Louisiana State Horticultural Society. F. H. Burnette, Baton Rouge.
Louisiana Stockbreeders' Association. W. H. Dalrymple, Baton Rouge.
Louisiana Sugar Planters' Association. Reginald Dykers, New Orleans.
Louisiana Trotting Horse Breeders' Association. J. Stone Ware, White Castle.
North Louisiana Truck Growers' Association. Shreveport.

Maine.

Androscoggin Valley Society. O. M. Richardson, Canton.
Central Maine Fair Association. Geo. R. Fuller, Waterville.
Eastern Maine Fair Association. E. L. Sterns, Bangor.
Maine Board of Cattle Commissioners. John M. Deering, Saco, and F. O. Beal, Bangor.
Maine Dairymen's Association. Leon S. Merrill, Solon.
Maine State Agricultural Society. J. L. Lowell, Auburn.
Maine State Jersey Cattle Association. N. R. Pike, Winthrop.
Maine State Pomological Society. March 28, 1873. W. J. Ricker, Turner.
Maine State Poultry and Pet Stock Association. A. L. Merrill, Auburn.
Northern Maine Fair Association. 1850. E. T. McGlauflin, Presque Isle.

Maryland.

Farmers' Club of Blackwater. F. H. Meyer, Cambridge.
Maryland Agricultural Society for the Eastern Shore (formed 1818). Col. Henry Hollyday, Jr., Easton.
Maryland Jersey Cattle Club. Asa B. Gardiner, Baltimore.
Maryland Live Stock Sanitary Board. C. W. Melville, Westminster.
Maryland State Horticultural Society. W. G. Johnson, College Park.
Wilner Farmers' Club.

Massachusetts.

Agricultural Society of Harvard University. Harold Styles, Cambridge.
Bay State Agricultural Society. N. I. Bowditch, Framingham.
Cape Cod Cranberry Growers' Association. 1838. Wm. M. Marsh, Boston.
Franklin Harvest Club 1873. C. B. Lyman, Southampton.
Hampden Harvest Club. 1857. Edwin C. Powell, Springfield.
Massachusetts Board of Cattle Commissioners. Dr. Austin Peters, Boston.
Massachusetts Cattle Owners' Association. J. L. Harrington, Lunenburg.
Massachusetts Creamery Association. A. M. Lyman, Montague.
Massachusetts Forestry Association. Allen Chamberlain, Tremont Building, Boston.
Massachusetts Fruit Growers' Association. March 21, 1895. C. A. Whitney, Upton.
Massachusetts Horticultural Society. Robert Manning, 101 Tremont street, Boston.
Massachusetts Society of Beekeepers. March 24, 1906. Miss S. J. C. Needham, West Peabody.
New England Cranberry Sales Company. Bridgewater.

Michigan.

Central Michigan Poultry and Pet Stock Association. J. A. Turner, Lansing.
Eastern Michigan Poultry Association. Irvin S. Niles, Croswell.
Holstein-Friesian Club of Michigan. J. H. Johnson, Farmington.
Michigan Dairymen's Association. February, 1885. S. J. Wilson, Flint.
Michigan Improved Live Stock Breeders' and Feeders' Association. December 17, 1890. A. C. Anderson, East Lansing.
Michigan Merino Sheep Breeders' Association. 1880. E. N. Ball, Hamburg.
Michigan State Association of Beekeepers. 1869. Elmore Hunt, Lansing.
Michigan State Association of Farmers' Clubs. February 1, 1894 (136 clubs in 32 counties. 8,000 members). Mrs Myra W. Cheney, Mason.
Michigan State Grange. April 15, 1873. J. W. Hutchins, Hanover.
Michigan State Horticultural Society. R. D. Graham, Grand Rapids.
Michigan State Live Stock Sanitary Commission. Henry H. Hinds, Stanton.
Michigan State Poultry Association. Daniel Thomas, Pontiac.
Northern Michigan Beekeepers' Association. E. E. Coveyon, Petoskey.

Minnesota.

Farmers' Club of Minnesota. D. A. Gaumnitz, St. Anthony Park.
First District Breeders' Association. Dr. A. C. Wedge (president), Albert Lea.
Minnesota Cattle Breeders' Association. 1905. J. B. Irwin, Minneapolis.
Minnesota Fanciers' Association. H. J. Goette, St. Paul.
Minnesota Farmers' Clubs. A. D. Wilson, St. Anthony Park.
Minnesota Field Crop Breeders' Association. C. P. Bull, St. Anthony Park.
Minnesota Horse Breeders' Association. G. W. Patterson, Worthington.
Minnesota Live Stock Breeders' Association. Andrew Boss, St. Anthony Park.
Minnesota Rose Society. Mrs. F. H. Gibbs, St. Anthony Park.
Minnesota Sheep Breeders' Association. C. W. Glotfelter, Waterville.
Minnesota Stallion Registration Board. Andrew Boss, St. Anthony Park.
Minnesota State Agricultural Society. C. N. Cosgrove, Hamline.
Minnesota State Bee-Keepers' Society. Rev. C. D. Blaker, Minneapolis.
Minnesota State Dairymen's Association. John H. Morley, Owatonna.
Minnesota State Farmers' Institute. A. D. Wilson, St. Anthony Park.
Minnesota State Food and Dairy Commission. E. K. Slater, St. Anthony Park.
Minnesota State Forestry Association. Prof. E. G. Cheyney, St. Anthony Park.
Minnesota State Grange. Mrs. G. W. Baird, Edina Mills.
Minnesota State Horticultural Society. A. W. Latham, Minneapolis.
Minnesota State Poultry Association. Chas. O. Johnson, Minneapolis.
Minnesota Swine Breeders' Association. D. A. Gaumnitz. St. Anthony Park.
North Star Poultry Association. Will H. Darby, Owatonna.
Red River Valley Horticultural Society. Prof. Wm. Robertson, Crookston.
Southern Minnesota Horticultural Society. O. M. Peterson, Albert Lea.
Southern Minnesota Poultry and Pet Stock Association. R. B. Thompson, Albert Lea.

Southern Minnesota and Western Wisconsin Beekeepers' Association. O. S Holland, Winona.
Southwestern Minnesota Poultry Association. A. D. Nelson, Windom.
Third District Breeders' Association. J. H. Timpane (president), Waterville.

Missouri.

Agricultural Club. Howard Hackedorn, University of Missouri, Columbia.
Central Missouri Shorthorn Association. Moberly.
Missouri Agricultural Coöperative Association. February 21, 1908. Oscar D. Riggs, Wetherby.
Missouri-Arkansas Horticultural Society. Mammoth Springs, Ark.
Missouri Breeders of Improved Live Stock. Columbia.
Missouri Corn Growers' Association. S. M. Jordan, Columbia.
Missouri Horse Breeders' Association.
Missouri Improved Live Stock Breeders' Association. December 9, 1897. Geo. B. Ellis, Columbia.
Missouri Jersey Cattle Club. D. B. Matthews, Kirksville.
Missouri Sheep Breeders' Association. October 2, 1906. M. V. Carroll, Sedalia.
Missouri State Association of Beekeepers. R. A. Holekamp, St Louis.
Missouri State Berkshire Breeders' Association. December, 1905. D. B. Matthews, Kirksville.
Missouri State Board of Agriculture. Inc. March 13, 1865. Geo. B. Ellis, Columbia.
Missouri State Board of Horticulture. Org. January 5, 1859 ; inc. 1907. W. L. Howard, Columbia.
Missouri State Dairy Association. 1890. R. M. Washburn, Columbia.
Missouri State Grange. C. O. Raine, Canton.
Missouri State Horticultural Society. D. A. Robnett, Columbia.
Missouri State Poultry Association. T. E. Quisenberry, Slater.
Missouri State Poultry Board. Inc. 1907. T. E. Quisenberry, Slater.
Missouri State Veterinary Association. Dr. S. S. Brown, Kansas City.
Missouri Swine Growers' and Breeders' Association. 1908. C. A. Willson, Columbia.
Missouri Valley Horticultural Society. Muncie, Kansas.
Missouri Valley Veterinary Medical Association. Dr. B. F. Kaupp, Kansas City.
North Missouri Live Stock Breeders' Association. Princeton.
South Missouri Fruit Growers' Association. Willow Springs.
South Missouri Horticultural Association. West Plains.
South Missouri Improved Live Stock Breeders' Association. July 24, 1908. J. W. Copeland, Cabool.

Mississippi.

Long Beach Truck Growers' Association. Long Beach.
Mississippi Agricultural Association. H. E. Blakeslee, Jackson.
Mississippi Horticultural Society. Mrs. C. S. Evarts, Ridgland.
Mississippi Live Stock Association. Prof. Archibald Smith, Agricultural College.
State Live Stock Sanitary Board of Mississippi. Prof. Archibald Smith, Agricultural College.

Montana.

Bitter Root Fruit Growers' Association. George Brooks, Hamilton.
Flathead Farmers' Protective Association. E. C. Hedges, Kalispell.
Montana Dairymen's Association. 1906. W. J. Elliott, Bozeman.
Montana Poultry Association. V. J. Babcock, Great Fall.
Montana Registered Cattle Breeders' Association. John W. Pace, Helena.
Montana State Agricultural Society. John W. Pace, Helena.
Montana State Board of Horticulture. February 17, 1899. Joseph W. Wallisch, Butte.
Montana State Fair Association. John W. Pace, Helena.
Montana State Horticultural Society. February, 1898. M. J. Elrod, Missoula.
Montana Stock Growers' Association. April 3, 1885. H. R. Wells, Miles City.
Montana Wool Growers' Association. J. H. Gilteman, Helena.

Nebraska.

Association of Agricultural Students. March 10, 1897. Harry G. Gould, Republican City.
Nebraska Aberdeen-Angus Breeders' Association. D. N. Syford, Lincoln.
Nebraska Boys' Agricultural Association. Lester Moore, Seward.
Nebraska Corn Improvers' Association. 1902. E. G. Montgomery, Lincoln.
Nebraska Dairymen's Association. 1885. C. S. Bassett, Gibbon.
Nebraska Duroc-Jersey Breeders' Association. W. G. Unitt, Seward.
Nebraska Farmers' Institute Convention. Val Keyser, Lincoln.
Nebraska Girls' Domestic Science Association. 1905. Miss Grace Aldrich, Ord.
Nebraska Home Economics Association. January 17, 1907. Mrs. Val Keyser, Lincoln.
Nebraska Improved Live Stock Breeders' Association. Dr. A. T. Peters, Lincoln.
Nebraska Park and Forestry Association. February 15, 1899. L. B. Craig, York.
Nebraska Poland China Breeders' Association. C. H. Dawson, Endicott.
Nebraska Red Polled Breeders' Association. September 5, 1907. W. F. Schwab, Clay Center.
Nebraska Shorthorn Breeders' Association. Ray Page, Friend.
Nebraska State Bee Keepers' Association. Miss Lillian E. Trester, Lincoln.
Nebraska State Board of Agriculture. W. R. Mellor, Lincoln.
Nebraska State Horticultural Society. L. M. Russell, Lincoln.
Nebraska State Poultry Association. September 26, 1892. L. P. Ludden, Lincoln.
Nebraska State Swine Breeders' Association. W. G. Unitt, Seward.
Nebraska State Veterinary Medical Association. Dr. H. Jensen, Weeping Water.
Southeastern Nebraska Fruit Growers' Association.
Western Nebraska Stock Growers' Association. E. M. Searle, Jr., Lincoln.

Nevada.

Nevada State Beekeepers' Association. G. W. Mills, Fallon.

New Hampshire.

Concord State Fair. Charles B. Hoyt, Sandwich.
New Hampshire Horticultural Society. H. F. Hall, Durham.
New Hampshire State Board of Agriculture. Nahum J. Bachelder, Concord.
New Hampshire State Board of Cattle Commissioners. April 7, 1891. Nahum J. Bachelder, Concord.
New Hampshire State Dairymen's Association. Frank W. Sanders, Bristol.
New Hampshire State Grange. Geo. R. Drake, Manchester.
New Hampshire State Horticultural Society. December 20, 1893. E. Dwight Sanderson, Durham.

New Jersey.

Monmouth County Produce Exchange. Freehold.
New Jersey Forestry Association. J. F. Hall, Atlantic City.
New Jersey State Association of Beekeepers. Geo. N. Wanser, Cranford.
New Jersey State Horticultural Society. Org. August 17, 1876; inc. December 15, 1887. H. G. Taylor, Riverton.
New Jersey State Tuberculosis Commission. Franklin Dye, Trenton.

New Mexico.

Angora Goat Breeders' Association of New Mexico. June 22, 1907. M. L. Bugbee, Silver City.
Cattle and Horse Protective Association of Central New Mexico. February 18, 1901. E. A. Clemens, Magdalene.
Hondo Water Users' Association. Roswell.
Las Cruces Melon Growers' Association. Las Cruces.
New Mexico Horticultural Society. 1886. L. B. Prince (president), Santa Fé.
New Mexico Sanitary Board. J. H. La Rue, East Las Vegas.
New Mexico Sheep Growers' Association. H. F. Lee, Albuquerque.
New Mexico Sheep Sanitary Board. Harry F. Lee, Albuquerque.
Pecos Water Users' Association. Inc. October 24, 1904. A. M. Hove, Carlsbad.
Rio Grande Water Users' Association. H. B. Holt, Las Cruces.

New York.

Adirondack Beekeepers' Society. A. W. Cary, Glen Falls.
Agricultural Experts' Association. George T. Powell (president), 57 East 42nd street, New York City.
Beekeepers' Association of Eastern New York. D. A. Frazier, Albany.
Central New York Farmers' Club. John E. Graham (president), Utica.
Chautauqua and Erie Grape Company. Westfield.
Chemung Valley Breeders' Association. N. M. Compton, Elmira.
Cornell University Dairy Students' Association. John Kelly, Lysander.
Cortland Union Beekeepers' Association. Josephine H. Loope, McGraw.
Genessee Valley Poultry and Pigeon Association. September 14, 1906. F. A. Newman, Rochester.
Holstein-Friesian Cattle Breeders' Association. Wing R. Smith, Syracuse.
Long Island Cauliflower Association. Mattituck and Riverhead.
Long Island Produce Exchange. Riverhead.
Mohawk Valley Poultry Association. H. F. Down, Little Falls.
New York Agricultural Experimenter' League. Prof. Chas. H. Tuck, Ithaca.
New York Poultry and Pigeon Association. H. V. Crawford, Montclair.
New York State American Merino Sheep Breeders' Association. 1879. J. H. Earll, Skaneateles.
New York State Association of Bee Keepers' Societies. C. B. Howard, Romulus.
New York State Association of County Agricultural Societies. Albert E. Brown (treasurer), Batavia.
New York State Breeders' Association. Albert E. Brown, Batavia.
New York State Dairymen's Association. Org. 1877; inc. 1881. Thomas E. Tiquin, Sherburne.
New York State Fair. S. C. Shaver, Syracuse.
New York State Farmers' Union. J. C. Barger (president), Atwater.
New York State Fruit Growers' Association. Org. 1902; inc. 1905. E. C. Gillett, Penn Yan.
New York State Plant Breeders' Association. Dr. H. J. Webber, Ithaca.
New York State Tuberculosis Committee. F. W. Smith, Syracuse.
Racquette Valley and St. Regis Valley Agricultural and Horticultural Society. W. N. Clark, Potsdam.
St. Lawrence Poultry Association, September 20, 1906. C. F. Smithers (president), Heuvelton.
Tobacco Growers' Association. Ed. H. Lewis, Baldwinsville.
Unadilla Valley Poultry and Pet Stock Association. January, 1906. R. T. Talbot, New Berlin.
Western New York Evaporated Fruit Dealers' Association. 1896. C. C. Young, Ontario.
Western New York Fair Managers' Association. Albert E. Brown (president), Batavia.
Western New York Horticultural Society. 1855. John Hall, Rochester.
Western New York Jersey Cattle Breeders' Association. Chas. H. Kingsbury, Barnards.

North Carolina.

Brushy Mountain Fruit Growers' Association. W. T. Rowland, Taylorsville.
East Carolina Truck and Fruit Growers' Association. Wilmington.
Interstate Fruit Growers' Association. J. E. Johnson, Mt. Airy.
North Carolina Forestry Association. W. W. Ashe, Raleigh.
North Carolina State Horticultural Society. 1885. F. C. Reimer, West Raleigh.

North Dakota.

North Dakota Dairymen's Association. T. A. Hoverstad, Fargo.
North Dakota Farmers' Institute. George Hollister, Fargo.
North Dakota Good Roads' Association.
North Dakota Grain Growers' Association.
North Dakota Live Stock Association. W. B. Richards, Agricultural College.
North Dakota Poultry Breeders' Association. L. D. Canniff, Fargo.
North Dakota State Horticultural Society. 1904. O. O. Churchill, Agricultural College.

Ohio.

Agricultural Student Union. R. S. Shields, Townshend Hall, Columbus.
Northwestern Ohio Poultry and Pet Stock Association. V. Crabtree, Tiffin.
Nurserymen's Association of Ohio. January 15, 1908. W. B. Cole, Painesville.
Ohio Dairy Association. E. S. Guthrie, Columbus.
Ohio Holstein-Friesian Association. January 14, 1908. A. G. Byers, Westerville.
Ohio Horse Breeders' Association. Samuel Taylor, Grove City.
Ohio Improved Chester White Record Association.
Ohio Jersey Cattle Club. Tom Dempsey, Westerville.
Ohio Live Stock Association. C. S. Plumb, Columbus.
Ohio Merino Sheep Breeders' Association. Wesley Bishop, Delaware.
Ohio Poland-China Record Company. 1877. Carl Freigau, Dayton.
Ohio Sheep Breeders' Association. H. P. Miller, Westerville.
Ohio Shorthorn Breeders' Association. R. Carpenter, Mansfield.
Ohio Spanish Merino Sheep Breeders' Association. F. C. Stanley, Edison.
Ohio State Horticultural Society.
Ohio State Live Stock Commission. Dr. D. N. Kinsman, Columbus.
Ohio Swine Breeders' Association. Ernest Friegau, Columbus.

Ohio Woolgrowers' and Breeding Association. H. P. Miller, Westerville.
Panhandle Beekeepers' Association. W. L. Kinsey, Blaine, Ohio.
Western Reserve Holstein-Friesian Club. F. W. Pierce (president), East Claridon.

Oklahoma.

Farmers' Educational and Co-operative Union. J. S. Murray, Oklahoma City.
Oklahoma Association of Nurserymen. C. E. Garee, Noble.
Oklahoma Berkshire Association. F. W. Hall, Lone Wolf.
Oklahoma Draft and Coach Horse Association. W. T. McDonald, Stillwater.
Oklahoma Fruit Growers' Association. J. B. Thorburn, Oklahoma City.
Oklahoma Horticultural Society. John Roach, Edmond.
Oklahoma Improved Stock Breeders' Association. 1896. John Fields, Oklahoma City
Oklahoma Livestock Association. W. E. Bolton, Woodward.
Oklahoma Live Stock Sanitary Commission. W. E. Bolton, Woodward.
Oklahoma Shorthorn Breeders' Association. M. H. Lyons, El Reno.
Oklahoma State Agricultural Society. John Fields, Oklahoma City.
Oklahoma State Branch of American Poultry Association. B. C. Hansen, Shawnee.
Oklahoma State Dairymen's Association. December 12, 1907. R. C. Potts, Stillwater.
Oklahoma State Farmers' Congress. October 18, 1907. H. H. Stallard, Snyder.
Oklahoma State Poultry Association. J. W. Nicely, Oklahoma City.
Oklahoma Swine Breeders' Association. C. S. Williams, Tishomingo.
State Fruit Growers' Association. Ed. E. Blake, Oklahoma City.

Oregon.

Grande Ronde Valley Fruit Growers' Union E. Z. Carbine, La Grande.
Hood River Apple Growers' Union. 1903. E. H. Shepard, Hood River.
Hood River Fruit Growers' Union. 1893. C. H. Sproat, Hood River.
Hood River Horticultural Society. J. L. Hershner, Hood River.
Northwest Fruit Growers' Association. February 15, 1894. E. R. Lake, Corvallis.
Oregon State Horticultural Society. 1885. E. R. Lake, Corvallis.

Pennsylvania.

Pennsylvania Dairy Union. 1898. W. E. Perham, Niagara.
Pennsylvania Forestry Association. Dr. Joseph T. Rothrock, Commissioner of Forestry, Harrisburg.
Pennsylvania Nurserymen's Association. Earl Peters, Mt. Holly Springs, Pa.
Pennsylvania State Bee Keepers' Association. April 12, 1904. A. F. Satterthwait, Harrisburg.
Pennsylvania State Board of Agriculture. Hon. N. B. Critchfield, Harrisburg.
Pennsylvania State Live Stock Breeders' Association. E. S. Bayard, East End, Pittsburg.
Pennsylvania State Poultry Association. J. D. Nevius, Mint Arcade, Philadelphia.
State Horticultural Association of Pennsylvania. Originally the "Fruit Growers' Society of Eastern Pennsylvania;" later the title was changed to "Pennsylvania Fruit Growers' Society," and finally to present title. 1859 Enos B. Engle, Harrisburg.

Porto Rico.

Porto Rico Horticultural Society. December, 1907. C. R. Newton, San Juan.

Rhode Island.

Florists' and Gardeners' Club. W. E. Chappell, Providence.
Rhode Island Horticultural Society. C. W. Smith, Providence.
Rhode Island League of Improvement Societies. 1905. L. D. Burlingame, Providence.
Rhode Island Poultry Association. Org. 1886; inc. 1889. W. I. Brown, Providence.
Rhode Island State Board of Agriculture. John J. Dunn, Providence.
Rhode Island State Grange. Frank E. Marchant, West Kingston.

South Carolina.

Beaufort Truckers' Exchange. Beaufort.
Meggett Truck Farmers' Association. Meggett.
South Carolina Agricultural Society. 1785.
South Carolina Live Stock Association. October, 1902. J. M. Burgess, Clemson College.

South Dakota.

South Dakota Breeders' Association. H. C. Warner (president), Forestburg.
South Dakota Improved Live Stock and Poultry Breeders' Association. February 2, 1903. Prof. James W. Wilson, Brookings.
South Dakota State Agricultural Society. C. N. McIlvaine, Huron.
South Dakota State Beekeepers' Association. Jessie Mattison, Tabor.
South Dakota State Board of Agriculture. 1884. C. M. McIlvaine, Huron.
South Dakota State Corn Growers' and Breeders' Association. September, 1905. H. C. Warner, Forestburg.
South Dakota State Horticultural Society. Org., February 5, 1885; inc., January 9, 1890. Prof. N. E. Hansen, Brookings.
South Dakota State Swine Breeders' Association. S. A. Braa, Artesian.

Tennessee.

Aspen Hill Fruit and Vegetable Growers' Association. Aspen Hill.
Central Tennessee Beekeepers' Association. 1906. J. M. Buchanan, Franklin.
Coffee County Truck Growers' Association. Manchester.
Culleoka Cantaloupe and Vegetable Growers' Association. Culleoka.
Dickson County Cantaloupe Growers' Association. Dickson.
East Tennessee Farmers' Convention and Institute. May 16, 1872. H. A. Morgan, Knoxville.
East Tennessee Good Roads Association. Geo. H. Freeman, Knoxville.
East Tennessee Poultry Association. John E. Jennings, Knoxville.
Franklin County Truck Growers' Association. Winchester.
Humbolt Fruit Growers' Association. Humbolt.
Humphreys County Cantaloupe and Truck Growers' Association. Denver.
Knox County Berry and Truck Growers' Association, Knoxville.
Lewis County Cantaloupe and Vegetable Growers' Association. Hohenwald.
Lincoln County Cantaloupe and Truck Growers' Association. Fayetteville.
Madison County Fruit and Truck Growers' Association. Jackson.
Middle Tennessee Farmers' Institute. Robert Gallagher, Shelbyville.

Middle Tennessee Poultry Association. R. S. Hopkins, Columbia.
Planters' Protective Association of Kentucky, Tennessee and Virginia. Mrs. N. E. Greene, Guthrie, Ky.
Pulaski Cantaloupe Growers' Association. Pulaski.
Sweet Mountain Cantaloupe Growers' Association. Lawrenceburg.
Tennessee Berkshire Association. Reuben Gentry, Nashville.
Tennessee Dairy Association. December 4, 1907. S. E. Barnes, Knoxville.
Tennessee Mammoth Bronze Turkey Club. W. J. Landess, Fayetteville.
Tennessee State Beekeepers' Association. March 11, 1908. John Davis, Springhill.
Tennessee State Fair Association. J. W. Russwurm, Nashville.
Tennessee State Horticultural Society. 1906. Charles A. Keffer, Knoxville.
Tennessee State Nurserymen's Association. May 2, 1906. G. M. Bentley, Knoxville.
Tennessee State Poultry Breeders' Association. John A. Murkin, Jr., Nashville.
Tullahoma Truck Growers' Association. Tullahoma.
Warren County Truck Growers' Association. McMinnville.

Texas.

Cass County Fruit and Truck Growers' Association. Atlanta.
Falfurrias Truck and Melon Growers' Association. Falfurrias.
Marshall Tomato Growers' Association. Marshall.
Northern Texas Beekeepers' Association. W. H. White, Blossom.
South Texas Beekeepers' Association. Paul Nubower, Flores.
South Texas Fruit and Truck Growers' Association. S. A. McHenry (president), Cuero.
Southern Texas Truck Growers' Association. San Antonio.
Texas Bee Keepers' Association. L. H. Scholl, New Braunfels.
Texas Corn Growers' Association. 1904. A. M. Ferguson, Sherman.
Texas Division Southern Cotton Association. J. Garrity, Corsicana.
Texas Farmer Boys' and Girls' League. Rice Dennis (president), Milano.
Texas Nurserymen's Association. 1899. John S. Kerr, Sherman.
Texas Nut Growers' Association. 1905. Fernando Miller, Lampasas.
Texas Rice Growers' Association. A. E. Groves, Houston.
Texas Seed Breeders' Association. D. A. Saunders, Waco.
Texas Sheep and Goat Breeders' Association. J. Robertson (president), Grandview.
Texas State Dairymen's Association. C. O. Moser, Denison.
Texas State Farmers' Congress. July, 1897. T. W. Larkin, Denison.
Texas State Farmers' Union. D. J. Neill, (president), Fort Worth.
Texas State Horticultural Society. 1885. E. J. Kyle, College Station.
Texas State Live Stock Commission. Rob. J. Kleberg, Corpus Christi.
Texas Swine Breeders' Association. M. M. Offutt, Cleburne.

Utah.

Cache Valley Beekeepers Association. Wm. Homer, Trenton.
Green River Fruit Growers' Association. G. P. Schlosser.
Utah Forestry Association. Prof. C. A. Whiting, Salt Lake City.
Utah State Association of Beekeepers. A. Fawson, Salt Lake City.
Utah State Poultry Association. December 20, 1907. C. J. Sanders, Salt Lake City.

Vermont.

Dog River Valley Fair. J. H. Winch, Northfield.
Lemoine Valley Fair. O. M. Waterman, Morrisville.
Union Agricultural Society. G. S. Swan, North Tunbridge.
Valley Fair. O. F. Benson, Brattleboro.
Vermont Atwood Club Register. Geo. Hammond, Middlebury.
Vermont Beekeepers' Association. W. G. Larrabee, Shoreham.
Vermont Dairymen's Association. 1870. Fred L. Davis, North Pomfret.
Vermont Jersey Cattle Club. T. G. Bronson, East Hardwick.
Vermont Maple Sugar Makers' Association. H. B. Chapin, Middlesex.
Vermont Merino Sheep Breeders' Association. L. H. Skiff, Middlebury.
Vermont State Board of Agriculture. Fred L. Davis, North Pomfret.
Vermont State Cattle Commission. C. J. Bell, East Hardwick.
Vermont State Fair. 1907. Fred L Davis, North Pomfret.
Vermont State Horticultural Society. 1896. Wm. Stuart, Burlington.
Vermont State Poultry Association. January 17, 1893. Frank W. Sault, Swanton.

Virginia.

Crozet Fruit Growers' Association. Walter Whateley, Crozet.
Eastern Shore Produce Exchange. A. J. McMath, Onley, Virginia.
Emporia Fruit Growers' Association. April 18, 1908. T. W. Howard.
North Garden Farmers' Club. Dr. S. A. Robinson (president), Crozet.
North Shenandoah Fruit Growers' Association. December, 1907. R. L. Campbell, P.O. Capon Road.
Piedmont Apple Growers' Association. Crozet.
Shenandoah Valley Fruit Growers' Association. 1908. J. Lucian Moomaw, Basic City.
Southern Produce Company. C. W. Coleman, Norfolk, Virginia.
Stuarts Dwarf Horticultural Society. J. L. Black, Staunton.
Tomahawk Club of Farmers, The. J. D. Anderson, Rondo.
Virginia Dairymen's Association. Prof. W. D. Saunders, Blacksburg.
Virginia Fruit Growers' and Packers' Association. April 25, 1908. R. E. Wayland, Crozet.
Virginia State Farmers' Institute. J. Lucian Moomaw, Cloverdale.
Virginia State Horticultural Society. Org. 1897; inc. 1900. Walter Whateley, Crozet.

Washington.

Inland Registered Stock Breeders' Association. February, 1901. W. A. Linkieter, Pullman.
Lewis River Fruit Growers' Union. Woodland.
Logged-off Lands Association. Joel Shomaker (president), Everett.
Washington Forestry Association. Albert Bryan, Seattle.
Washington Fruit Growers' Association. C. M. Nelson, Winlock.
Washington Good Roads Association. Sam Hill, Seattle
Washington Live Stock Association. January, 1904. Frank H. Goike, Spokane.
Washington State Beekeepers' Association. Mrs. Legh R. Freeman, North Yakima.
Washington State Buttermakers' Association. December, 1907. Prof. Ira P. Whitney, Pullman.
Washington State Dairymen's Association. 1893. Ira P. Whitney, Pullman.
Washington State Horticultural Society. January, 1905. L. G. Monroe, Spokane.

Washington State Wheat Growers' Association. Prof. E. E. Elliott, Pullman.

Yakima Valley Fruit and Produce Growers' Association. June 18, 1906. W. J. Smith, Granger.

West Virginia.

Greenbrier Valley Horticultural Society. W. W. Stevens, Alderson.

West Virginia Dairy Association. J. R. Wells, Bens Run.

West Virginia Fish and Game Protective Association. L. C. Crile, Clarksburg.

West Virginia Forestry Association. January 28, 1908. Prof. A. W. Nolan, Morgantown.

West Virginia Good Roads Association. James Wier, Elkins.

West Virginia Horticultural Society. Prof. F. E. Brooks, Morgantown.

West Virginia Live Stock Association. H. E. Williams, Charleston.

West Virginia Nurserymen's Association. R. R. Harris, Harrisville.

West Virginia Poultry Association. G.C. Starcher, Weston.

West Virginia Sheep Breeders' and Wool Growers' Association. J. B. Huyett (president), Charlestown.

West Virginia State Grange. M. V. Brown, Buffalo.

Wisconsin.

Agricultural Society. Chas. F. Fechter, Manitowoc.

Baraboo Valley Agricultural Society. October 1, 1875. W. A. Stolte, Reedburg.

Central Wisconsin Agricultural Society. A. G. Pankow, Marshfield.

Fox River Driving Association. 1896. Jos. Koffend, Jr., Appleton.

Inter-State Agricultural Society. C. S. Van Auken, La Crosse.

Northern Wisconsin Agricultural Society. Robt. B. Clark, Chippewa Falls.

Northern Wisconsin and Michigan Poultry Association. L. C. Wemple, Marinette.

Northwestern Wisconsin Beekeepers' Association. Dr. J. B. Rick, Mishicot.

Southwestern Wisconsin Agricultural Society. T. M. Priestley, Mineral Point.

Wisconsin Agricultural Experiment Association. 1901. R. A. Moore, Madison.

Wisconsin Berkshire Swine Breeders' Association. Robt. E. Pye, Beloit.

Wisconsin Feathered Stock Association. Thos. Koss, Milwaukee.

Wisconsin Butter Makers' Association. J. G. Moore, Madison.

Wisconsin Cheese Makers' Association. Org. 1892, inc. 1899. W. S Baer, Madison.

Wisconsin Dairymen's Association. February 15, 1872. A. J. Glover, Fort Atkinson.

Western Guernsey Breeders' Association. C. L. Hill, Rosendale.

Wisconsin Horse Breeders' Association. J. G. Fuller, Madison.

Wisconsin Horticultural Society. Society was founded in 1865, being the successor of the Wisconsin Fruit Growers' Association which was organized in 1853. The present association was chartered in 1871. F. Cranefield, Madison.

Wisconsin Jersey Breeders' Association. E. E. Wyatt, Tomah.

Wisconsin Live Stock Breeders' Association. 1903. F. H. Scribner, Rosendale.

Wisconsin Poland-China Swine Breeders' Association E. E. Jones, Rockland.

Wisconsin Sheep Breeders' Association. February 3, 1904. Wm. F. Renk, Sun Prairie.

Wisconsin Short Course Alumni Association. A. L. Stone, Madison.

Wisconsin Shorthorn Breeders' Association. 1895. A. L. Stone, Madison.

Wisconsin State Association of Beekeepers. Gus Dittmer, Augusta.

Wisconsin State Board of Agriculture. 1897. John M. True, Madison.

Wisconsin State Cranberry Growers' Association. S. M. Whittlesey, Cranmoor.

Wisconsin State Poultry Association. James F. Irvine, Oshkosh.

Wyoming.

Fremont Horticultural Society.

Wyoming Horticultural Society. September, 1907. Prof. Aven Nelson, Laramie.

Wyoming State Board of Cattle Commissioners. George East, Cheyenne.

Wyoming State Board of Horticulture. December, 1905. Prof. Aven Nelson, Laramie.

Wyoming Stockgrowers' Association. Miss Alice Smith, Cheyenne.

Wyoming Woolgrowers' Association. Geo. S. Walker, Cheyenne.

II. CANADA

GENERAL HORTICULTURE

Canadian Association of Nurserymen. C. C. R. Morden, Niagara Falls, Ont.

LIVE-STOCK

Horses.

Belgian Draft Horse Breeders' Association. October 3, 1907. J. Arthur Paquet, Quebec.

Canadian Hackney Horse Society. H. M. Robinson, 8 Albert street, Toronto, Ont.

Canadian Percheron Horse Breeders' Association. 1908. F. R. Pike, Pekisko, Alta.

Canadian Pony Society. H. J. P. Good, Toronto, Ont.

Canadian Shire Horse Association. George G. de W. Greene, Department of Agriculture, Toronto, Ont.

Canadian Thoroughbred Horse Society. J. J. Dixon, Toronto, Ont.

Clydesdale Horse Association of Canada. 1886. J. W. Sangster, Toronto, Ont.

French-Canadian Horse Breeders' Association. Dr. J. A. Couture, Quebec.

Cattle.

Canadian Aberdeen-Angus Association. May 4, 1906. F. J. Collyer, Welwyn, Sask.

Canadian Ayrshire Breeders' Association. 1870. W. F. Stephen, Huntingdon, Que.

Canadian Guernsey Breeders' Association. 1905. H. W. Corning, Cheggogin, N. S.

Canadian Hereford Breeders' Association. R. J. Mackie, Oshawa, Ont.

Canadian Jersey Cattle Club. R. Reid, Berlin, Ont.

Canadian Red Polled Association. May, 1906. Dr. A. W. Bell, Winnipeg.

Dominion Cattle Breeders' Association. A. P. Westervelt, Department of Agriculture, Toronto, Ont.

Dominion Shorthorn Breeders' Association. W. G. Pettit, Freeman, Ont.

Holstein-Friesian Association of Canada. G. W. Clemons, St. George, Ont.

North American Galloway Breeders' Association. 1882. David McCrae, Guelph, Ont.

Western Stock Growers' Association. 1898. R. G. Mathews, Macleod, Alta.

Sheep and Swine.

Dominion Sheep Breeders' Association. A. P. Westervelt, Department of Agriculture, Toronto, Ont.

Dominion Swine Breeders' Association. A. P. Westervelt, Toronto, Ont.

Alberta.

Alberta Cattle Breeders' Association. 1899. E. L. Richardson, Calgary.

Alberta Farmers' Association. 1905. E. J. Fream. Innisfail.

Alberta Horse Breeders' Association. 1899. E. L. Richardson, Calgary.

Alberta Sheep Breeders' Association. 1899. E. L. Richardson, Calgary.

Alberta Stock Growers' Asso. G. C. Bergman, Erskine.

Alberta Swine Breeders' Association. 1899. E. L. Richardson, Calgary.

Central Alberta Stock Growers' Association. June 12, 1906. G. C. Bergman, Erskine.

There are no dairymen's associations in Alberta, all the work being done by the provincial department of agriculture. Mr. C. Markee is the Dairy Commissioner.

British Columbia.

British Columbia Dairymen's Association. 1906. F. M. Logan, Victoria.

British Columbia Flockmasters' Association. 1900. G. H. Hadwin, Duncan.

British Columbia Fruit Growers' Association. February 1, 1889. W. J. Brandrith, Ladner.

British Columbia Horticultural Association. 1905. W. J. Brandrith, Ladner.

British Columbia Stock Breeders' Association. 1906. F. M. Logan, Victoria.

Royal Agricultural and Industrial Association of British Columbia. W. H. Keary, New Westminster.

Victoria Fruit Growers' Association. W. C. Grant, Gordonhead.

Manitoba.

Cattle Breeders' Association of Manitoba. 1892. Dr. A. W. Bell, Winnipeg.

Horse Breeders' Association of Manitoba. 1891. Dr. A. W. Bell, Winnipeg.

Manitoba Dairy Association. 1893. W. J. Carson, Winnipeg.

Manitoba Veterinary Association. Dr. F. Torrance, Winnipeg.

Sheep and Swine Breeders' Association of Manitoba. 1895. Dr. A. W. Bell, Winnipeg.

Western Horticultural Society. F. W. Broderick, Winnipeg.

Winnipeg Industrial Exhibition Association. 1891. Dr. A. W. Bell, Winnipeg.

New Brunswick.

Farmers' and Dairymen's Association of New Brunswick. B. M. Fawcett, Upper Sackville.

Fruit Growers' Association of New Brunswick. December 14, 1904. S. B. Hatheway, Fredericton.

Nova Scotia.

Fruit Growers' Association. W. R. Starr, Wolfville.

Maritime Stock Breeders' Association. Org. December 29, 1896; inc. May, 1902. F. L. Fuller, Truro.

Nova Scotia Farmers' Association. 1896. C. R. B. Bryan, Durham.

Nova Scotia Fruit Growers' Association. Org. 1863; inc. May, 1864. S. C. Parker, Berwick.

Ontario.

Burlington Horticultural Association. W. E. A. Peer, Freeman.

Cheese and Butter Makers' Association of Peterborough. Ashley Andrews, Bensfort.

Coöperative Fruit Growers of Ontario. 1906. P. W. Hodgetts, Toronto.

Dairymen's Association of Eastern Ontario. (1867) 1878. R. G. Murphy, Brockville.

Dairymen's Association of Western Ontario. 1868. Frank Herns, London.

(About forty years ago (in 1867) the first Dairymen's Association was organized at Ingersoll, and was known as the Canadian Dairymen's Association. This Association held all its meetings in the West (mostly in Ingersoll) and after ten years of successful work it was found necessary to divide the Province into two parts, and have two Associations, the one to be called the eastern and the other the western, Yonge street, Toronto, being the dividing line between the two. The first annual convention for the eastern part of the Province was held at Belleville, on the 21st and 22d, February, 1878.)

Fruit Growers' Association of Ontario. 1858. P. W. Hodgetts, Toronto.

Niagara Peninsula Fruit Growers' Association. Carl E. Fisher, Burlington.

Ontario Bee Keepers' Association. 1880. P. W. Hodgetts, Toronto.

Ontario Horse Breeders' Association.

Prince Edward Island.

Prince Edward Island Dairy Association. 1899. John Anderson, Kensington.

Prince Edward Island Fruit Growers' Association. 1896. A. E. Dewar, Charlottetown.

Prince Edward Island Live Stock Breeders' Association. 1908. Tupper Ferguson, Marshfield.

Quebec.

Dairymen's Association of the Province of Quebec. Inc. December, 1882. O. E. Dalaire, St. Hyacinthe.

District of Bedford Dairymen's Association. February 25, 1890. W. H. Lynch, Sweetsburg.

District of Huntingdon Dairymen's Association. March 7, 1883. W. H. Walker, Huntingdon.

General Stock Breeders' Association of the Province of Quebec. Dr. J. A. Couture, 49 Garden street, Quebec.

Milk Shippers' Association, District of Montreal. 1909. W. F. Stephen, Huntingdon.

Pomological and Fruit Growing Society of the Province of Quebec. February 8, 1894. Peter Reid, Chateauguay Basin.

Quebec Branch of the Holstein-Friesian Association of Canada. F. E. Came, Sault au Recollet.

Sheep Breeders' Association of the Province of Quebec. Dr. J. A. Couture, Quebec.

Swine Breeders' Association of Quebec. Dr. J. A. Couture, Quebec.

Saskatchewan.

Saskatchewan Stock Breeders' Association. John Bracken, Regina.

There are no dairymen's associations in Saskatchewan all the work being done by the provincial department of agriculture. Mr. W. A. Wilson, Regina, is Superintendent of Dairying for Saskatchewan.

III. THE WORLD'S HORTICULTURAL SOCIETY

Worthy of special mention in this connection is The World's Horticultural Society, organized at Chicago on August 25, 1893. It grew out of the World's Congress on Horticulture held at Chicago in that month. The society was designed, in the language of its constitution, "to promote correspondence and to facilitate exchange of plants and information between the countries of the world."

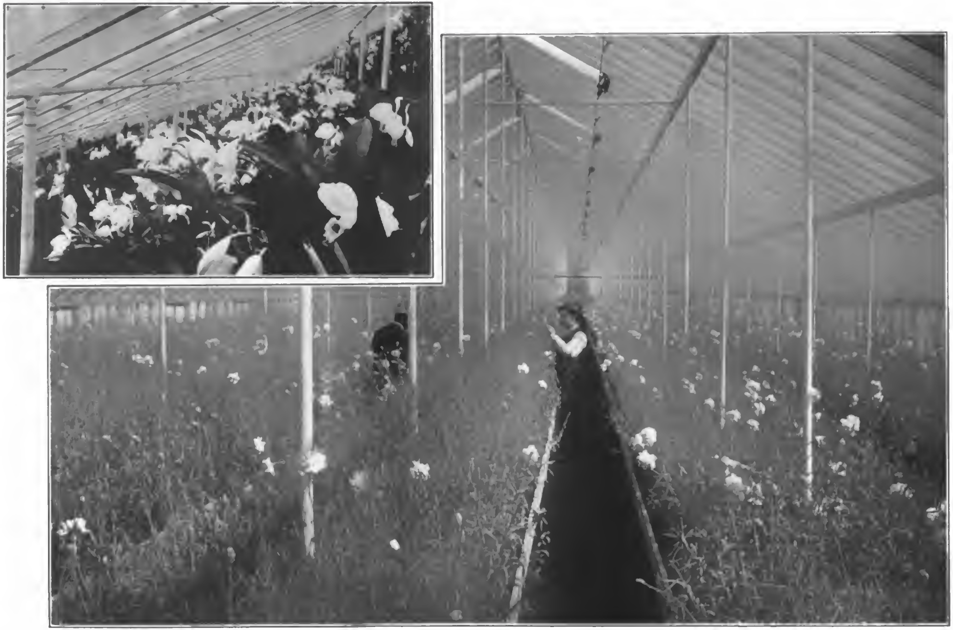
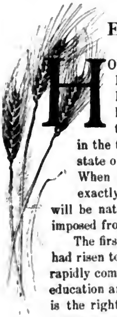


Plate XVI. Farming under glass. A modern carnation house; also a house of orchids

CHAPTER VIII

EDUCATION BY MEANS OF AGRICULTURE



HOW TO PROVIDE APPLICABLE EDUCATIONAL FACILITIES TO PERSONS ON THE LAND is the paramount question in the development of the best kind of country life. For many centuries it has been recognized that the husbandman should be schooled for his occupation, and still the world has not yet worked out any adequate system whereby this may be done. It is not strange that this is so, for education for every person in the terms of his own life can come only in a highly developed democratic society. The state of education at any time, therefore, is a true measure of the democracy of that time. When all traditional and class distinctions shall have vanished, we shall have schooling exactly adapted to the necessities and aspirations of all the people. This schooling, of course, will be native and natural, proceeding directly from the individual himself rather than being imposed from without.

The first schools were for the privileged classes. This was necessarily so, because these classes had risen to the point of desiring it. The world has belonged to the privileged classes. It is now rapidly coming to belong to all. It is a modern theory that the state, or society, should support education and that education should be free. It is a modern practice that to be educated or trained is the right of every person, and that every person may demand it of society. It is a contemporaneous conviction that the person may be educated or trained by means of the things with which he lives: since so many persons live by labor, the rise of industrial education (of which agricultural education is a part) has come to be a characteristic expression of our time.

The rise of science education, and of technical and industrial education, was at first a challenge to the older literary means; but now we begin to understand that all means of training are good and necessary, and that we need many means if we are to reach all the people rather than a few people.

Why education by means of agriculture was not possible in practice two centuries ago, is indicated by the following quotations from Elmer Ellsworth Brown's "The Making of Our Middle Schools" in the United States: "Colonial society was not yet democratic. There was much in it that pointed forward to democracy, but the leaders refused to believe the signs. Seventeenth-century America, like seventeenth-century England, presented well-marked social distinctions; the people constituted a succession of social planes. The highest and the lowest were lacking here, but the several grades of higher and lower were pretty sharply distinguished. The great body of the people were those known as Goodman or Goodwife So-and-so. Below these were common servants; above were families whose lords were entitled to the designation 'Mr.' (Of the freemen of Massachusetts constituted before 1649, one in fourteen had the title Mr.) At the top were the magistrates and ministers. The intermediate ranks were carefully graded; and seats were assigned in the meeting-house accordingly, one pew being designated as 'first in dignety, the next behind it to be 2d in dignety,' and so on. (The seating committee at Woburn, Mass., in 1672, was instructed by the town to respect 'estate, office and age' in the discharge of their function. At Stamford, Conn., in 1673, the seating was according to 'dignity, agge and estate.' Changes in the system of seating were indicative of change in social conditions.) Similar distinctions were observed in the colleges. At Yale, the practice of arranging the names of the students in the annual catalogue according to the rank of the parents was not discontinued till 1767; and at Harvard not till three years later."

"In this state of society, no public secondary school seems to have been even thought of for the great body of citizens—the middle or lower middle class. It was thought desirable that all should know how to read. And a college training was needed by members of the directive class. The secondary school was not a mean between these extremes, but rather an institution subsidiary to the college; that is, a preparatory school in the narrower sense. Promising youth, whatever their social station, were encouraged to go to school. But their education was preparation for a place in an upper, that is, a ruling or at least a directing-class.

"The ecclesiastical origin of our education is recalled by the fact that that portion of the directive class for which the colleges and grammar schools were chiefly intended was the ministry of the churches. The good of the state was thought of in all of these foundations; but the thought of the church was uppermost, and it is doubtful whether our earlier colleges would have been founded at all, if it had not been for the desire to provide an educated ministry. Closely connected with this desire was the ambition to educate the red natives of the country in the Christian faith—an ambition which appeared in both whimsical and pathetic manifestations.

"The schoolmasters of the colonial period may be roughly divided into three classes. There were a few men of scholarly preparation who made teaching the work of their lives, and kept up the best traditions of the free-schoolmasters of Old England—of Mulcaster and Brinsley and Charles Hoole. Then there were young clergymen, and ministers of non-episcopalian denominations, recently from college, who taught school while waiting for a call to the pastoral office. Finally, there was a miscellaneous lot of adventurers, indented servants, educated rogues, and the like, all either mentally or morally incompetent, or both, who taught school only to keep from starving."

We may now discuss some of the epochs or events in the rise of education by means of agriculture, with special reference to the history in North America. But it must be distinctly understood that this discussion is not offered as a complete history, nor does it profess to record all the schools of agriculture that may have been established on this continent; it gives enough of the history, however, the Editor hopes, to illustrate the main movement of the evolution. The whole subject needs to be gone over in detail, as a contribution to the history of the rise of industrial education.

SOME BEGINNINGS IN EDUCATION BY MEANS OF AGRICULTURAL SUBJECT-MATTER.

At the time of the renaissance or revival of learning, in the fifteenth century, there was what Quick has called an "idolatry of books." These books were in Latin and Greek; and they were "authorities." The renaissance was a gradual evolution out of traditional or embalmed ideas. Its education was a protest against the formal scholasticism of mediæval times. It was a gradual feeling for closer touch with the affairs of life. The evolutionary movements were many and diverse, but the general trend was toward emancipation from the past.

One of the great advances in education was made by the Jesuit societies. They taught that the pupil should be interested in his subject, and they held that he should be led, not driven; and they contended, also, that learning should have some relation to living. Rabelais, early in the sixteenth century, taught that the individuality of the pupil should be considered, and that material for education should be drawn from the external world more than from books,—from the heavens, the trees, or even from the accustomed trades of men. He would train the physical man. Education should not be a mere pouring-in, as of water into an urn. Comenius (1592 to 1671) would "fit youth for the investigation of the causes of things." He would know the external world: "Come forth, my son. Let us go into the open air. There you shall view whatsoever God produced from the beginning and doth yet effect by Nature." He would organize all knowledge so as to bring the outline of it within reach of the child mind, and would secure ideas by means of objects rather than by means of words. He is the founder of method in education. Comenius proposed a system, and he is called the father of the science of education.

The teachings of Bacon substituted fact for fancy. Rousseau (1712 to 1778) broke squarely with the prevailing systems. Things that are natural are thereby right. He would know nature. It is better for children to go free until they are twelve than to go to school. Pestalozzi (1746 to 1827) would, like Comenius, educate everybody. He started a school for the poor. He kept children in return for the work they did on the farm, thus establishing one of the first distinct kinships of education with agriculture. But he would not tell: he would develop or draw out. Each child is a separate study. He would encourage its activities, and lead it. Thereby, he completed the natural method of education which had begun centuries before with the Jesuits.

Froebel (1782 to 1852) carried the natural method into successful practice and detail. Like Pestalozzi, he would direct the child's playfulness. His first efforts were in the direction of nature-study. He interested the pupils in horticulture and in whatever hand-work they had to do. He would not be a teacher, but a gardener; the child-garden—the kindergarten—expresses his method.

The Swiss influence in education was also extended by the work of Fellenberg (1771-1844), who established the school of Hofwyl, that became famous. Fellenberg was an agriculturist as well as educator and publicist; he was specially interested in the peasantry of his country, and his school motive was to train the pupil for his business or trade. Manual labor in field and shop was a necessary part of the system. Fellenberg taught that the poor and the rich should be brought together in one school, each having opportunities for their appropriate means of development. Agriculture should be the basis of such a school. Fellenberg's methods had distinct influence in America, as we shall see. He attracted pupils from the United States.

It will be seen that the direction of this evolution is toward nature and naturalness. Whether Greek or mathematics, history or philosophy, chemistry or botany, the subject should apply to the pupil, interest him, become a part of him, be adapted to his mind and growth. All subjects of intellectual inquiry are legitimate for the schoolroom. Science is as useful as classics, and classics is as useful as science ; but they may not be equally useful to the same mind. But whether classics or science, the subject-matter is of less importance than the pupil. The common life and the common thinking must be vivified, and be made the means of training men.

The substitution of the language of the country for the Latin, as the vehicle in which instruction was to be given, struck at the very root of the scholastic exclusiveness. The fearless work of Thomasius in Germany had great influence in this direction. This was one of the first great steps towards popularizing learning.

These ideas naturally began to crystallize into definite plans and institutions. Agriculture was recognized in institutions earlier than we are aware, and we are surprised to find it in unexpected places. There is even a legend that King Alfred established a school where farm boys were to be taught and that this school was the beginning of Oxford University; but this lacks historical verification.

The definite founding of industrial and agricultural schools.

The first distinct advance in the actual teaching of common-life subjects to common people, seems to have been that of Francke (1663 to 1727), at Halle, Saxony. He was the center of the Pietist movement, which sought to impress the spiritual aspect of religion into teaching. He was deeply interested in the poor and the orphans, and established schools for them. To these pupils, aside from the regular subjects "there should be taught out of school hours, and particularly in excursions or walks," according to Rein, "all kinds of useful knowledge, 'as it were by play.' . . . With this came the beginning of manual training, since the orphans during their leisure hours were required to grind with the hand mill, to work in the house, kitchen and garden, to sew, knit, card wool, and spin." The plan of studies of these schools was first published in 1697. The educational and philanthropic enterprises set on foot by Francke are still in existence at Halle.

The ideas of Francke spread and prospered : and many fearless innovators espoused them. Into this awakening consciousness came Ferdinand Kindermann, "father of industrial education." He was a Bohemian. His teaching attracted the attention of Maria Theresa, who, towards the close of her reign, inaugurated, in the language of S. G. Williams, "a work for schools such as no crowned head had ever before dreamed of." Her educational reforms were in the hands of Von Felbiger. The purpose was to popularize education. Kindermann had introduced hand-work into his parish schools in 1771. Lange writes as follows of Kindermann's work in Schmidt's *Geschichte der Pädagogik* : "The most general spread of Felbiger's school reform took place in Bohemia, where the Dean Ferdinand Kindermann, of Kaplitz, had previously done good work, and for this work in the schools he was made a member of the nobility with the name of Von Schulstein. He had reorganized his parochial school and gained for it such a reputation that his plan was much copied. In it, and in those elementary schools modeled after his plan, reading, writing, arithmetic, religion and religious history, morality, orthography, music and agriculture, were taught. When in 1773 his school was raised to the rank of a normal school he enlarged it by creating an industrial school thinking it necessary to include industrial work in the curriculum, as only in this way could the proper spirit and ability to work, a love for the school and a pleasure in it, be brought about in the children. This was to be accomplished by the alternation of the usual branches of study with industrial work, and it also at the same time presented the possibility of earning in the school itself the money necessary for books and other materials. He thereby showed the poor schoolmaster how he could better his livelihood through industrial classes. His wife by knitting, sewing, spinning, carding, etc., and he by tree culture, kitchen-gardening, silk culture, etc., could gain something and thereby fill out his odd hours usefully and with pleasure."

Even before Kindermann had established his technical school training, distinct progress had been made in the establishing of agricultural education. These early attempts were necessarily supported by individuals, societies or religious bodies, for the era of state aid for general education had not yet arrived. Thomas P. Gill writes as follows of the early movement in France : "The National Society of Agriculture of France, in 1761, urged the appointment of agricultural professors, and charged several of its own members with a propagandist mission to arouse and enlighten agricultural opinion. Some great proprietors were inspired by this means to found schools of agriculture in different places. One was established at La Rochette in 1763, another near Compiègne in 1771, and agricultural instruction was given at the Seminary of Angoulême. Louis XVI, in 1787, created an experimental sheep farm at Rambouillet, where he introduced flocks of Spanish Merino sheep, which soon greatly enhanced the prosperity of the farmers of La Brie, Beauce, Burgundy, Champagne, and Picardy. At the time of the Convention, the bases of the great system of technical education of France were laid down, but nothing was done for agriculture. In 1800, François de Neufchâteau, a former Minister of the Interior, who had the distinction of foreseeing at that date the danger to European agriculture of American competition, laid before Bonaparte an elaborate scheme for agricultural education, which he had copied from the Abbé Rozier, who had propounded it in 1770 ; but, though the First Consul in the main approved, the scheme was never carried out. In 1819 a private individual, Matthieu de Dombasle, established with funds which he had raised by public subscription an agricultural school near Nancy. This school became very famous, and was frequented by pupils from Germany, Austria, Switzerland, and other parts of the continent; but when Dombasle died, it had to succumb, as it was receiving no assistance from the state. It left, however, its traces, for in 1829, the school of Grignon, near Versailles, which has since been taken up by the state, and made one of the great national schools of agriculture, and in 1833 the school of Grandjouan, and in 1840 that of Saulsaie, which have also since become state schools, were founded by pupils of Matthieu de Dombasle." The first regular system of agricultural education supported by the state in France was inaugurated by the law of 1848.

Mulhall states that "it is hardly too much to say that Hungary has done more than any other nation in the way of agricultural schools. The first was established in 1779, at Zarvas, by a patriotic gentleman named Samuel Teschedik; the second in 1786, by Cristof Nako at Nagy-Micklós; the third was the famous Georgicon academy at Kezthely, founded and liberally endowed by Count Festetics, in 1797. This last was for a long period the model agricultural college of Europe, but after a prosperous career of fifty years it was suppressed by the Austrian government in 1848, because all the professors and pupils took part in the struggle for independence under Kossuth." The present system of instruction in Austria dates from 1850.

In Bohemia, an agricultural school was opened in the village of Tirnova, in 1791.

The agricultural college of Hohenheim, Würtemburg, one of the most famous in the world, was founded in 1818. It has a large model farm. German-speaking peoples have done much for agricultural education. "It was about one hundred years ago," writes C. K. Adams in 1886, "that Frederick the Great conceived the idea of improving the resources of his kingdom by the establishment of agricultural schools and the reclaiming and improving of waste lands. Everybody knows that the absorbing ambition of that great monarch was to make Prussia one of the foremost powers of Europe. He had the sagacity to perceive that this could only be done by developing in every practicable way the natural resources of the realm. Accordingly, though his kingdom was small and poor, he set apart as much as thirty-two million dollars a year for the purpose of improving its agricultural condition His successors followed his example, and the development of agricultural instruction has steadily progressed down to the present day. Just after the battle of Jena, for example, when Prussia had been reduced to about one-half its former territory and population, the famous school at Moeglin was founded and put under the direction of the celebrated savants, Thaer and Wolff. After the revolution of 1848, the department of agriculture was raised to the dignity of a separate ministry, and from that time to the present the policy of the government has led to the constant enlargement of existing schools and to the frequent establishment of new ones. The example of Prussia was followed by other states. The far-famed academy of Tharandt was founded in 1811, in the midst of the turmoil incident to the Napoleonic wars. In a similar manner, after the battle of Sadowa the same government, that of Saxony, established the agricultural college of the University of Leipsic."

It is not the purpose of the present sketch to trace the rise of the more modern agricultural education of Europe, particularly not that of a collegiate or special kind; yet even a cursory sketch would not be complete without a mention of Albrecht Thaer, Fig. 98 (1752–1828), whose work marks an epoch in the history of agriculture. This remarkable man successfully applied science and business to farming, and opened the way for the modern agriculture, at least in Germany. Persons began to visit his farm at Celle, in Hanover; and to these persons he began to give instruction in 1802, and out of this grew the Agricultural Institute of that town. In 1806 he founded the agricultural school at Moeglin, near Berlin, which became famous, and which was raised to the Royal Academy of Agriculture, in 1824. Thaer's books are monumental, and they have been widely translated.

Fig. 98. Albrecht (Albert D.) Thaer. Adapted from Bechstein's "Dreihundert Bildnisse und Lebensabrisse berühmter deutscher Männer."

The scheme of Samuel Hartlib.

The fantastic plan of Samuel Hartlib deserves record here, as a contribution to the history of the ideas involved in the rise of agricultural education, although it probably had no direct effect on the development of institutions. The scheme is that contained in a little book styled, "An Essay for Advancement of Husbandry-Learning: or Propositions for the Erecting a Colledge of Husbandry: and, in order thereunto, for the taking in of Pupills or Apprentices. And also Friends or Fellowes of the Same Colledge or Society. London, Printed by Henry Hills. 1651." The book is a small affair, numbering altogether only seventeen pages, and four of most entertaining introduction. This introduction is the only part of the writing that bears Hartlib's name, but the whole book and scheme are his. He asserts that it is the "Narrownes of our Spirits" which make us miserable, and that if we were properly awakened to the advantages which lie about us "we could not be without Lucriferous Employments." Wherefore he proposes a school of husbandry. "Why may we not conclude that in the Science and Trade of Husbandry, which is the Mother of all other Trades and Scientificall Industries, a Collegiall way of Teaching the Art thereof will be of infinite Usefulness?"

The things that Hartlib would teach are set down as follows:

"(1.) Tillage, or setting or sowing of several sorts of Corne or Graine, for the reliefe and sustenance of man and beast. (2.) The breeding of Cattel, (in which the breeding of Sheepe may seem particular). (3.) The feeding of Cattel. (4.) The Use of the Dairie. (5.) The planting of Orchards. (6.) The planting of Gardens. (7.) The breeding and feeding of Swine. (8.) The breeding and feeding of the several sorts of tame Poultry. (9.) The planting of Hops. (10.) The sowing of Hempe, Flax, or Rape. (11.) The breeding, preserving and taking of wilde Beasts, as Conies, etc. (12.) The breeding, preserving or taking of wilde fowle, particularly of Duckes in and by a Decoy. (13.) The making and managing of Rivers, Moats, Ponds, &c., for the preserving and taking Fish of all sorts for the use and sustenance of man. (14.) The planting of Woad, and all outlandish rare or extraordinary Roots, fruits or plants. (15.) The dreining, fencing, mowing and making of Grasse in Meadowes into Hey. (16.) The making of Malt. (17.) And (that now so exceeding necessary endeavour) the planting all sorts of Wood for Timber or fire.

"As these are encouraged and enabled: so is a Nation more or lesse prosperous, or outwardly happy; both these in their distinct natures or uses are most excellent; and are also (at least ought to be) inseparable companions: of which if either precede it is Ingenuity; for that Industry as it is distinct from Ingenuity, can do nothing till the other have contrived what and how."

The means of securing the establishment of the institution are these:

"That whereas it is manifest, that such a Colledge or Society cannot be erected without the building or buying (at least a long lease at an easie rent, if not the inheritance) of some large and convenient House, with some good quantity of Land adjoyning and belonging to it (though that is not all the Land which must be had for this purpose); and it is as manifest that such a purchase cannot be made without good Sums of Money.

"It is therefore desired, that all such Well-wishers to their Countrey's wealth and prosperity; be pleased to contribute such sums to this good and laudable Worke, as in their own Wisdomes and bounties appear necessary, and deliver the same into the hands of Mr. Samuel Hartlib, whose abundant Zeale for the Publique Good, renders him most worthy to be entrusted therewith, till there shall be a competent Stock obtained for the setting forward of this great and good Worke before mentioned: And to subscribe their Names and Sums; that so the whole Society (when erected) and the whole Nation (when in due time they shall have tasted the sweet effects from hence proceeding) may know to whome to render all due thanks through all Ages, as to the bountiful Promoters of; by contributing to a Designe so much conducing to the good of the present and Prosperity of all Ages to come: a Plentifull Reward to every Noble Spirit."

"It is therefore Offered, that whosoever shall disburse and engage any sum, for the encrease of that Stock, and consequently the imployment of the Society: shall by an unerring, unaltering rule, receive yearly; while his money remaines in the hands of the said Colledge, for every 100. pound, 20. pound, and so for a greater or lesser sum proportionably. And if any particular Person shall desire to have his sum disbursed, to be imployed in any one particular single part of this copious Art here before mentioned; he shall have his desire fulfill'd: provided that his Stock be sufficient to drive on that way; and that he be contented to forbeare his revenue till nature hath produced the returne.

"And whosoever shall thus engage, shall at any time (upon six moneths warning given) call in and again receive his sum formerly disbursed.

"And all those that shall thus engage, are desired to enter their Names and Sums, by subscribing and delivering the money into the hands of Mr. Samuel Hartlib. And for Security they shall have; As to Law, the Propounders bond; As to Love, the word of him that desires to prove himselfe a just and honest man, to God and man, (to his utmost power) and to all Engagers a faithful Steward."

Having founded the institution to his satisfaction he would next proceed to secure pupils or apprentices; and these were to be attracted by the following plan:

"If any Person of quality have a Son or Kinsman 15. years old or upwards, with whom he will give (besides well-suiting him with all necessary wearing apparel, and more, to the value of twenty marks; in such other necessaries, as the Undertaker shall appoint) 60.1. in ready money at his first Entrance, and bind him Apprentice for seven years; he shall be in that time faithfully instructed in both the Theorick and Practick parts of this (of all others) most Auncient, Noble and honestly gainfull Art, Trade or Mystery. And at the end of that time, he shall receive at one entire payment, to set up withal, 300. pound. And shall for foure years next ensuing the end of the said 7. years, receive at the end of every year 100. pound more; the better to support him till he have taken sufficient root." . . .

"Into this Colledge also any man may enter himselfe as a free-man, or Friend to, and Member of the Society; upon the following conditions.

"(1.) He must pay down at his Entrance 50.

pound, as given to the Society for the encouragement of Ingenuity in the practice of Experiments, for the obtaining of yet more perfection in this (almost) infinite Science.

"(2.) He must bring with him some skill, at least Ingenuity; and testifie himselfe to be a Well-willer to the profession and professors of Good-Husbandry; and particularly to the Master and Fellowes of this Society.

"(3.) He must produce at least 250. pound as a Stock to set up for himselfe, to be driven by himselfe, according to the best direction and assistance to be given by the Master and Fellowes of the Colledge.

"(4.) He shall (not swear, but) subscribe himself under hand & seale, a faithful seeker of the Advancement of the Mystery and Society; and to be aiding and assisting, to the Master and to the Fellowes to his power, at all times, and in all cases, (his own interest alwayes preserved), and to consent and submit to all such Orders, as shall be from time to time made, by the agreement of the Master and the Major part of the Fellowes of the said Colledge, for and concerning the same Society, and to stand to their Award in any case of difference: And not directly or indirectly to discover all or any part of the same Art or Mystery to any person whatsoever, upon any pretence whatsoever, without their consent first had and obtained.

"(5.) He must be alwayes in Commons at the Hall of said Society; at the rate of 8.s. per week, or such other rates more or lesse, as the then present state of things shall require. And he is alwayes to pay off all arreares at the end of each moneth at the farthest, without any deductions for absence how long or short soever. But if he keep a Servant (who must also be in Commons when present) he shall be allowed to deduct for his absence. As also he is not to be accomptable to the Stable for his Horse when absent.

"(6.) He shall at his first Entrance, pay for Himselfe 10. pound, for his Servant 5. pound, for his Horse 40.s. for their habitation: besides providing of all necessary furniture; but be ever after free till death or departure.

"(7.) Lastly he must be a single man; and if he shall at any time marry, he is from thenceforth to be accompted dead to the Society, to all intents and purposes whatsoever; save onely in point of debt or discovery."

These propositions seem to have been made public before the date of the volume before me, for, toward the close of the book, the writer again addresses his reader personally and complains of the "Backwardnesse of men" to join with him; and he then resolves the objections which have been urged against the scheme into three categories:

"First, the supposed Impossibility of performing (on my part) the thing promised.

"Secondly, the Newnesse of the Invention or Contrivance, which renders it within the list of things suspected.

"Thirdly, the Non-appearance of any such good Security as is held sufficient to encourage men to joyne with me freely, fully and speedily (that is, seasonably)."

To these he made answer, and seems to be somewhat impatient that the scheme should not at once arise into fulfilment. He proposed, elsewhere, that such a college should have four professors, one of whom should be sent to Africa, one to Asia, one to Europe and one to America, to study; and they should retract whenever they taught anything that should be proved to be erroneous,—which is an interesting comment on the teaching of the time.

Samuel Hartlib appears to have been the son of a Protestant Polish merchant who had fled to Prussia to escape persecution. He emigrated to England about 1628, and died there about 1670. He identified himself with the literary and educational life of his time, and also wrote profusely of education, agriculture and religion. He was the friend of Evelyn, Pepys and Milton, and the latter wrote to him his tractate on education. He appears to have been one of the group from which the Royal Society sprung. There is a record that he spent much of his income in helping indigent scholars, and he finally became so straitened in circumstances that Parliament granted him a small pension. He seems to have been a most benevolent and honorable character, and to have enjoyed the full confidence of his contemporaries. He was a friend and champion of Comenius, and had much to do in extending and defining his reforms. He had the widest interest in affairs, and espoused many diverse reforms. No less than twenty-two books are known to have been written by him. Among his books is "The Reformed Virginian Silk-Worm," 1655; and the curious "Samuel Hartlib, the Legacy of Husbandry," 1655, apparently a third and enlarged edition, wherein "are bequeathed to the Commonwealth of England, not onely Braband, and Flanders, but also many more Outlandish and Domestick Experiments and Secrets (of Gabriel Plats and others) never heretofore divulged in reference to Universal Husbandry." It is a book of direct experiments and experience.

Milton's "Tractate of Education," mentioned above, was written to Hartlib about 1650. It is a plea for release from scholastic traditions and for "beginning with arts most easy (and those be such as are most obvious to the sense)." The educational method that he advised was to be largely through readings; and, among other steps, one "would be to the Authors of Agriculture, Cato, Varro, and Columella; for the matter is most easy, and if the language be difficult, so much the better, it is not a difficulty above their years: and here will be an occasion of inciting and enabling them hereafter to improve the tillage of their country, to recover the bad soil, and to remedy the waste that is made of good; for this was one of Hercules's praises."

I. EARLY DISCUSSION AND CONDITIONS IN NORTH AMERICA

The earliest educational movements for the benefit of agriculture in North America—and probably the same may be said of any country,—were in the direction of experimentation and the organization of rural societies. The first American book on agriculture, Jared Eliot's, published 1748-1757, is largely a record of particular experiences; and experience is the sum of experiments. All the early writers urge the farmer to experiment. "It is greatly to be wished," writes Samuel Deane in 1790, "that more of these were made in this young country, where the knowledge of agriculture is yet in its infancy." In his dictionary, he devotes more than a page to "Experiments," but has no such entry as "Education." Even as late as 1815, "Experiments" is a caption in John Nicholson's "Farmer's Assistant," but "Education" is not mentioned. Deane deplored that "too many suffer useful discoveries to die with them." Nicholson thought "it would be well if some institution was devised and supported at the expense of the state, which should be so organized as would tend most effectually to produce a due degree of emulation among farmers, by rewards and honorary distinctions conferred on those who by their successful experimental efforts and improvements, should render themselves duly entitled to them. It might also be advisable to have two or three experimental farms in different parts of the state, under the direction of suitable superintendents, who should have the profits of the farms to themselves, and who should be excited to a degree of emulation by a reward given yearly to that superintendent which should be found the best entitled by his superior culture, and by the success of his experiments, when duly authenticated, and published yearly for the benefit of the community. Something like these might cost considerable at first; but might eventually be made the means of greatly enriching the state by improving its agriculture."

The anonymous author of "Rural Economy," published at Burlington, Vermont in 1792, devotes an entire chapter or essay to "Experimental Agriculture." He says that "forming experiments in husbandry is so much the taste of the present age, that perhaps it may not be amiss to offer a few remarks on the manner of conducting trials of this sort." He outlines seven types of experimental research, one of which is the study of "the comparative merit of the Old and New Husbandry." The New Husbandry is the tillage system of Jethro Tull, which was then a subject of much discussion, as it had been also in Eliot's day. Our author would conduct these investigations for their educational value quite as much as for the direct results which they might be expected to yield, for "no amusement in the world equals the forming and conducting experiments in agriculture."

Franklin, Washington and Jefferson exerted profound influence on applicable education and on agriculture. In his "Proposals Relative to the Education of Youth in Pennsylvania," 1749, Franklin pleaded for natural history and experimenting; and also for education in agriculture: "While they are reading natural history, might not a little gardening, planting, grafting, and inoculating be taught and practiced, and now and then excursions made to the neighboring plantations of the best farmers, their methods observed and reasoned upon for the information of youth, the improvement of agriculture being useful to all and skill in it no disparagement to any?" Francis Newton Thorpe, who has made a special study of Franklin's influence on education, writes: "I think that Franklin's conversations with Adam Smith largely explain the advocacy and insistence on sound agricultural methods so characteristic of the 'Wealth of Nations', and notably in its closing chapters."

Jefferson was much interested in all agricultural affairs (see p. 388, Vol. I), and he was himself a large planter. He made definite propositions for the organization of an agricultural society.

As early as 1820, and probably before that time, John Adlum, the grape pioneer, had applied to the President of the United States for "a lease of a portion of the public ground in the City, [Washington], for the purpose of forming a Vineyard, and of cultivating an experimental farm;" but the effort did not succeed.

Agricultural societies of many kinds came into existence toward the close of the eighteenth century. Plowing matches and fairs were one result of such organizations. A natural offspring of such institutions are the ministries of agriculture which have arisen in various countries within the past century. The remarks of Washington are interesting in this connection: "It will not be doubted, that with reference either to individual or national welfare, agriculture is of primary importance. In proportion as nations advance in population and other circumstances of maturity, this truth becomes more apparent, and renders the cultivation of the soil more and more an object of public patronage. Institutions for promoting it, grow up, supported by the public purse: and to what objects can it be dedicated with greater propriety? Among the means which have been employed to this end, none have been attended with greater success than the establishment of Boards, composed of proper characters, charged with collecting and diffusing information, and enabled by premiums and small pecuniary aids, to encourage and assist a spirit of discovery and improvement. This species of establishment contributes doubly to the increase of improvement by drawing to a common center the results, everywhere, of individual skill and observation and spreading them over the nation." In the administration of Benjamin Harrison, the United States Department of Agriculture, "supported by the public purse," and devoted to agricultural betterment, became an executive branch of government.

State of agricultural knowledge in Washington's day.

It may profit us to pause to recall the state of agricultural knowledge in Washington's time, in order that we may appreciate the extent of the discovery of fact and the application of it to the common affairs of life. The whole attitude of the farmer toward his business has changed since then, and will still change. A single discovery or invention may have far-reaching results. Silos, for example, mean more than mere receptacles in which green fodder is placed: they mean winter dairying, new conceptions of feeding, new cropping schemes, new relations to market problems, perhaps even new organization of the farm. George Washington was a representative and progressive farmer. His correspondence with Arthur Young (page 88) and with his farm foreman comprise good information of the agriculture of his time. Yet a person of Washington's time did not know why tillage makes the plant to thrive; the philosophy of enriching the land; the practice of tile-draining; a good moldboard plow; the use of farm machinery; the principles of animal-breeding; the principles of plant-breeding; how plants get their food; the nature of contagious disease; the life history of an insect; the commercial use of greenhouses; commercial horticulture; the canning of fruits; agricultural newspapers; agricultural schools; experiment stations.

Washington had never seen a silo, or a mowing machine, or a wire fence, or a grain drill, or a can of tomatoes. He wrote to Pearce, his foreman in 1791: "It is certainly a reflection upon a farmer to have his seeds to buy."

He did not know why trees blight, or milk sours; why the butter does not "come;" what a plant is composed of; what plowing accomplishes for the soil.

He had never heard of potassium, balanced ration, carbohydrates, protein, commercial fertilizer, butter-fat, antiseptic, germs, pollination, soil physics, cover-crop, leguminous plants, clean milk, or speculating in futures. He could not have understood a present-day agricultural book.

He lived in the "age of homespun." His active farming was done before the days of the cotton-gin and of every other great agricultural machine. He had not seen the transfer of manufacture to the factory, the development of transportation, the rise of the city, the relative decline of the rural town, and all the social and economic changes that have given new direction and meaning to our civilization. The great continental West was a mystery, and the upper Pacific little more than a report.

Since Washington's day have been developed such sciences as agricultural chemistry, bacteriology, sanitary science, mechanical engineering. All the great rural arts have developed or crystallized since then,—agronomy, horticulture, dairy manufacture, and all the special industries. There were no means of communication except the natural water-ways and the public highways, the latter execrably bad.

Yet Washington was a good farmer. He was a philosopher and a student of his conditions. The good farmer adapts himself to his time and place. Washington's farming was laid out as a system. Rotation was the foundation of the system. All his practices were part of his plan of organization, for he seemed to see the farming estate as a whole and not merely as a collection of fields. A well-organized farm scheme develops a philosophy of life. Moreover, he was deeply impressed with the occupation of agriculture. He wrote as follows to Arthur Young, in 1788: "The more I am acquainted with agricultural affairs, the better I am pleased with them; insomuch that I can nowhere find so great satisfaction as in those innocent and useful pursuits. In indulging these feelings, I am led to reflect how much more delightful to an undebauched mind is the task of making improvements on the earth, than all the vain glory which can be acquired from ravaging it, by the most uninterrupted career of conquests."

The century since Washington has been one of marvelous acquisition of knowledge affecting agriculture. We have reorganized and revolutionized our knowledge, and yet there are still poor farmers. There has been knowledge enough in any epoch to make good farmers for that epoch: the organizing of this knowledge into a practicable working system is the business of higher and special education.

[Following are references to editions of Washington's letters relating to his farm operations and inquiries: Consult "Letters from His Excellency General Washington to Arthur Young, Esq., F.R.S.: Containing an Account of his Husbandry, with a Map of his Farm; his Opinions on various Questions in Agriculture; and many Particulars of the Rural Economy of the United States." London, 1801. — "Letters from His Excellency George Washington to Arthur Young, Esq., F.R.S., and Sir John Sinclair, Bart., M.P.; Containing an Account of his Husbandry, with his Opinions on various Questions in Agriculture; and many Particulars of the Rural Economy of the United States." Alexandria, Va., 1803.—"Letters on Agriculture from His Excellency George Washington, President of the United States, to Arthur Young, Esq., F.R.S., and Sir John Sinclair, Bart., M.P.; with Statistical tables and Remarks, by Thomas Jefferson, Richard Peters and other Gentlemen, on the Economy and Management of Farms in the United States. Edited by Franklin Knight." Washington, 1847.—Letters of Washington to Sir John Sinclair on Agriculture and other topics. London, 1800. (In facsimile handwriting.)—"George Washington and Mount Vernon. A Collection of Washington's unpublished Agricultural and personal Letters. Edited with historical and genealogical introduction. By Moncure Daniel Conway. Brooklyn, 1889. Vol. IV of the Memoirs of the Long Island Historical Society.]

An eighteenth-century plan.

It would be difficult to determine the date of the first organized effort to found a school of agriculture in North America.

In 1792, Samuel L. Mitchell was made professor of natural history, chemistry and agriculture in Columbia College; and he was influential in establishing the New York Society for the Promotion of Agriculture.

As early as 1794 a definite educational scheme was outlined by a committee of the Philadelphia Society for Promoting Agriculture [see page 376, Vol. I].

At a meeting of the Philadelphia Society on January 21, of that year, it was

"*Agreed*, that Mr. Bordley, Mr. Clymer, Mr. Peters and Mr. Pickering, be a Committee to prepare Outlines of a Plan for establishing a State Society for the *Promotion of Agriculture;* connectecting with it the *Education of Youth* in the knowledge of that most important Art, while they are acquiring other useful *Knowledge suitable for the agricultural Citizens of the State:*

"And a Petition to the Legislature, with a view to obtain an Act of Incorporation."

A week later the "outlines of a plan" were presented to the Society, it having been brought into the committee by Mr. Peters. The legislature was to be asked to incorporate the proposed society. Details of the membership and organization were included in the report or application. Agricultural information was to be disseminated in whatever manner the legislature should think best, "whether by endowing professorships, to be annexed to the University of Pennsylvania and the College of Carlisle, and other seminaries of learning, for the purpose of teaching the chemical, philosophical and elementary parts of the theory of agriculture: Or by adding to the funds of the society, increase their ability to propagate a knowledge of the subject, and stimulate, by premiums and other incentives, the exertions of the agricultural citizens: Or whether by a combination of these means the welfare of the state may be more effectually promoted." County societies were to be created with "county schoolmasters" as secretaries; "and the schoolhouses the places of meeting and the repositories of their transactions, models, etc. The legislature may enjoin on these schoolmasters, the combination of the subject of agriculture with the other parts of education. This may be easily effected, by introducing, as school-books, those on this subject; and thereby making it familiar to their pupils." "When the funds of the society increase sufficiently to embrace the object, it will perfect all its efforts by establishing *pattern farms*, in different and convenient parts of the state." The recital of the things which might be done on these pattern farms would do credit to many an experiment station of the present day. "When the pecuniary affairs of the society become adequate, it will highly contribute to the interest of agriculture, if, at the expense of the society, some ingenious person or persons were sent to Europe, for the purposes of agricultural inquiries. It would be well too, if a few young persons, of promising abilities, were sent thither, to be instructed in the arts of husbandry, the breeding of cattle, etc., and to gain a practical knowledge on all subjects connected with this interesting, delightful and important business, on which the existence, wealth and permanent prosperity of our country so much depend." This report made to the society is most entertaining and wise. Its fate is recorded in a single sentence by Bordley: "The application was rejected; by *husbandmen* who were principally to be benefited."

The idea of the establishing of schools by agricultural societies took firm hold in the early days, and the persistence of the idea may be traced down to the passage of the Land-Grant Act in 1862. In fact, it is not yet extinct.

II. The School at Gardiner, Maine

By *S. L. Boardman*

The first agricultural, industrial and technical school that did actual work in North America was probably the Gardiner Lyceum, established at Gardiner, Maine, in 1821, and incorporated by the legislature of the state of Maine in 1822,—the second year after it became a state. Indeed, among the very first of the legislative acts of the new state was that incorporating this school of technology as follows:

"Be it enacted by the senate and house of representatives in legislature assembled, that an institution, designed to prepare youth by a scientific education to become skillful farmers and mechanics, be established in the town of Gardiner, to be called the Gardiner Lyceum, and that Robert Hallowell Gardiner, Peter Grant, Sanford Kingsbury, Frederic Allen, John Stone and Edward Swan, Esqs., be and are hereby incorporated into a body politic, by the name of the trustees of the Gardiner Lyceum."

The subject of enabling mechanics and farmers to become skilful in their respective pursuits had occupied the thoughts of the promoters of this new scheme for years prior to the above legislative act, which prepared the way to a public declaration of their intentions, the erection of a stone edifice, and the organization of a school.

The passage of this act was in answer to a petition signed by the above-named gentlemen, together with Richard Clay and Simon Bradstreet "respectfully representing that a donation had been offered of land lying on the Kennebec river, in the town of Gardiner, estimated at $4,000, for the purpose of establishing within said town a school for teaching mathematics, mechanics, navigation and those branches of natural philosophy and chemistry which are calculated to make scientific farmers and skillful mechanics."

The object for which this school was organized is further set forth in an address made by Mr. Gardiner after the trustees had nearly completed the school, or lyceum building. After alluding to the act of the legislature, he said: "The small number of mechanics acquainted with the principles of natural philosophy, upon which the successful operation of their arts depends, has long been a subject of regret, nor have our farmers hitherto had that knowledge which would enable them to improve the powers of their soil, or the machines necessary for cultivating it and preparing their products for markets. The knowledge necessary for these descriptions of persons is confined to colleges, but science is there taught, not to persons who are to make a practical use of it in after life, but as a part of a course of general education to those who are destined for the liberal professions."

To supply this deficiency was the object of the projectors of the lyceum and, although there was no existing institution to which they could refer as a prototype, yet they felt confident that their views were so practical and so obviously useful and so easily carried into effect that they must meet the approbation of the public. Again, after giving the plans quite in detail, Mr. Gardiner said: "The trustees consider the location of the lyceum, in the town of Gardiner, as peculiarly fortunate, from its central position, on a navigable river in a populous neighborhood and a fertile country, whose commerce is continually extending, and in a town possessing uncommonly fine mill privileges, and which already offers to the students in mechanics the exhibition of a greater variety of machinery, moved by water, than can be found in any other town in the state."

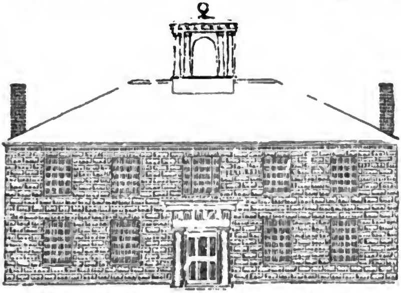


Fig. 99. The Gardiner Lyceum Building. Erected 1822—Burned 1870.
(From Journal Franklin Institute, Vol. 140, 1895.)

As evidencing the fact that the Gardiner Lyceum was intended to be a state and not a local institution, the board of visitors appointed under an act of February, 1823, were: The governor, Albion K. Parris, the president of the Senate, the speaker of the House of Representatives and the following gentleman, appointed by the governor: Rev. Dr. William Allen, president Bowdoin college, Brunswick; Rev. Dr. Jeremiah Chaplin, president Waterville college, Waterville; Hon. Daniel Cony, Augusta; Hon. Benjamin Vaughan and Hon. Ebenezer T. Warner, Hallowell; Hon. Enoch Lincoln, Paris; Thomas G. Thornton, Saco; Parker Cleaveland, professor Bowdoin college, Brunswick; William Ladd, Minot; Josiah Hook, Castine and Nathaniel Gilman, Waterville.

Having completed the building and given their address to the public, the trustees engaged Rev. Benjamin Hale, of Newburyport, Mass. (chapter X), who was a tutor in Bowdoin college, later a professor in Dartmouth college and then president of what is now Hobart college, to take charge of the school as principal. The first term of school began on the first of January, 1823, with twenty scholars, and was very successful, considering the novelty of the project. Hale developed a system of student self-government. Dr. Hale was succeeded as principal by John H. Lathrop, who later became a professor in Hamilton College, and then president of the state universities of Missouri, Indiana, and Wisconsin. He was succeeded by E. L. Cushing, who later became supreme judge of New Hampshire. Ezekiel Holmes was once principal.

In the year 1824, the lyceum received the gift of a small but valuable piece of land, well adapted to agricultural experiments. The legislature made an appropriation in 1823 of $1,000 from the state treasury, and the tax on the Gardiner bank for one year, amounting to another $1,000. In 1825, the legislature appropriated $1,000 a year for three years, and in 1828 extended it for three years more. This is probably the first state grant made in the United States for agricultural and technical education.

The year 1824 opened with an attendance of fifty-three, and, it becoming an absolute necessity that there should be more instructors, it was deemed highly important that one of them should be a permanent professor of agriculture. The trustees had in view the establishing of this professorship in connection with a practical farm: "First—to give the future agriculturist the knowledge of those principals of science upon which his future success depends and to let him see them reduced to practice. Second—To furnish a beneficial employment as recreation and to try a series of agricultural experiments adapted to the soil and climate of Maine." A department of carpentry and one of navigation were also established.

A boarding-house was erected in 1824 at which students could have board and washing for $1.25 a week, and room furnished with chairs and table and a cot and mattress for each individual for twenty-five cents a week. Bonds were required for the punctual payment of these bills. This boarding house was in charge of one of the instructors.

In 1825, there were 120 students. The year 1826 opened with a change in the personnel of the board of trustees, as well as the board of visitors which were now called the board of overseers. Among them were George Evans, William King, James Bridge, James Parker, Ruel Williams and Charles S. Davies, all leading citizens of the state.

The titles of the teachers were changed as follows: Benjamin Hale, A. M. and professor of chemistry and civil architecture: Ezekiel Holmes, M. D., professor of agriculture and natural history; Ebenezer F. Deane, A. B., professor of mathematics and natural philosophy. The number of scholars in 1826 was fifty-five, they coming from various towns in Maine, New Hampshire, Massachusetts and New Brunswick, there being but two natives of Gardiner.

The lyceum continued with varying success until the year 1832, when it was closed for lack of support and patronage. The institution was later opened as an academy, and subsequently the building was transferred to Gardiner as a high school, and it was subsequently burned. (Fig. 99.)

In brief, the original petition to the legislature of Maine to establish the lyceum contained the following as its leading object: "To give mechanics and farmers such a scientific education as will enable them to become skilled in their professions." The language of the Morrill act of 1862, in establishing the land-grant colleges in the different states, is that "without excluding other scientific and classical studies, it shall teach such branches of learning as are related to agriculture and the mechanic arts." The Gardiner Lyceum antedates the Morrill Land-Grant colleges by forty years of time, and stated the objects of the school in almost the same words as that employed by the Morrill act. Under the leadership of Ezekiel Holmes, the state of Maine established an independent institution on the Land-Grant funds of 1862, being the only one of the New England states to do this at first. Maine has also been the pioneer in New England in the evolution of a State University. We shall now be interested in the person of Ezekiel Holmes, a pioneer professor of agriculture in North America.

Ezekiel Holmes. (Fig. 100.)

Founder of improved agriculture in Maine, father of its agricultural literature and who secured the establishment of the state college of agriculture, now the University of Maine, as an independent institution, Ezekiel Holmes was born in Kingston, Mass., August 21, 1801. He entered Brown University when only seventeen years of age, graduating in 1821 and from the medical school of Maine, Bowdoin college, in 1824. At college his favorite studies were botany and mineralogy and while pursuing his medical studies he had the advantage of the lectures of Parker Cleaveland, who has been called "the father of American mineralogy," and of other noted teachers. Before entering upon his course at the medical school, he studied medicine with his uncle, Dr. Benjamin Chandler of Paris, and also taught the high school in that village. On one of his field excursions in that town, in company with Elijah L. Hamlin, he discovered the magnificent deposit of tourmalines at what is now known as Mount Mica—a place which has produced a larger number of these remarkable minerals and of more brilliant character than any other locality in this country—gems which now add glory to the cabinets of many Old-World museums. Receiving his medical degree in 1824, he married, August 14, 1825, Sarah E. Benson of Livermore, and settled in Gardiner to practice his profession. The Gardiner Lyceum was opened for pupils in 1823 and, after settling in Gardiner, the position of Instructor in the Lyceum presented more pleasures than his profession and, having great love for agriculture and the natural sciences, Dr. Holmes accepted the position of "permanent instructor in agriculture"—a place completely suited to his tastes. He gave lectures on agriculture before what was called a Special Class in Agriculture, had charge of the farm, which was operated by him and on which the records show he agreed to employ twelve students during one summer; he was also steward. While living in Gardiner, Dr. Holmes edited, in 1828, The New England Farmers' and Mechanics' Journal, a very creditable monthly magazine which was published for a single year only.

In 1829, he moved to a farm in the town of Starks on Sandy river, where he introduced thoroughbred stock. Subsequently he removed to Gardiner and edited for two years, the American Standard—an anti-slavery newspaper. In 1832 he settled in Winthrop on the shore of Lake Annabescook, which place he loved and which was ever after his home. About this time Waterville college introduced a system of workshop instruction, including chemistry and natural history and Dr. Holmes was appointed lecturer, performing its duties, in connection with other work, till 1837. The influence of the Vaughans in the section of Maine where Dr. Holmes lived, as well as of other progressive agriculturists, including Benjamin Hale, Sanford Howard, Henry Dearborn, Samuel and Elijah Wood, William Richards and Sylvester Gardiner, upon the public spirit and intelligence of the farmers of that day, as well as the good results of the instruction at Gardiner Lyceum, were a potent force at that early date, when it was decided that an agricultural journal was necessary for the better advancement of improved agriculture. Accordingly, the Kennebec Farmer was first published January 21, 1833, by William Noyes, of which Ezekiel Holmes was editor. The name was soon changed to that of Maine Farmer, which name it has since borne. Dr. Holmes was its editor in 1833 to his death in 1865—a period of thirty-two years. During that long period Dr. Holmes was foremost in every movement for the improvement of Maine agriculture—

Fig. 100. Ezekiel Holmes.

even before the Maine Farmer was established he was the father of all plans for advancement in the rural economy of the state. He was the first person in Maine to introduce blooded stock—bringing in the first thoroughbred Shorthorn bull in 1827; the first thoroughbred Jerseys in 1855 and the first Southdown and Cotswold breeds of sheep. As early as 1839 he advocated the larger culture of hemp. In 1835 he published a treatise entitled "The Northern Shepherd"—being a report of a committee of the Kennebec County Agricultural Society upon the Diseases and Management of Sheep,—the first original work on Maine agriculture.

In 1838, acting under the State Board of Internal Improvement, Dr. Holmes published a report of an Exploration and Survey of the Territory of the Aroostook river—the now famous "Garden of Maine"—then an entirely undeveloped section of Maine, in which he advocated the establishment of a state experimental farm in that section of what he termed the "richest soil in the state." As early as 1840 he proposed a state board of agriculture which was not established, however, until 1852, of which Dr. Holmes was the first secretary, holding the position for three years ; while in 1855, largely through his own efforts, the legislature incorporated the state agricultural society, the constitution of which was drafted by his own hand and of which he was secretary for ten years, or, till his death. In 1861 the legislature authorized a scientific survey of the state of which Dr. Holmes was appointed chief and naturalist. Work was commenced under a well-appointed scientific staff and two annual reports of progress were published, but the coming on of the Civil war put a stop to its work, which has never been resumed. To these reports Dr. Holmes made important scientific contributions—on the physical geography of the state, on its birds, on the fishes and on the geology of Aroostook county.

Aside from all the duties, Dr. Holmes was constantly active in other directions. He was learned in everything pertaining to the physical or natural history of Maine. He knew its geology and its botany thoroughly; he knew the birds and fishes; he was a fine chemist and was well acquainted with entomology. He knew all the writers of our agricultural literature, ancient and modern. His services were much sought as a lecturer before lyceums and agricultural societies. In the more weighty public affairs of state his counsel was sought. He was a member of the state legislature in 1835, 1836, 1837, 1838, 1839 and 1850 and was a state senator in 1840 and 1841, while he was the candidate of the liberal party for governor in 1852 and 1853. In these positions Dr. Holmes always acted wisely in all measures for the improvement of the state. His last public act and in many respects his noblest and one for which he will be longest remembered was that of securing, by an eloquent and masterly argument before the legislature, the passage of an act which secured the establishment of the state college of agriculture and the mechanic arts, under the Morrill Land-Grant bill of 1862, as an independent institution disconnected from any other college in the state. This was in February, 1865—but one week before his death. In recognition of this service the new building of the Agricultural College and Experiment Station of the University of Maine at Orono, was named Holmes Hall and dedicated with appropriate exercises, May 25, 1904. Ezekiel Holmes died at Winthrop, February 9, 1865.

Robert Hallowell Gardiner. Fig. 101.

The founder of the Gardiner Lyceum did much for the agriculture of early Maine. His fine stone mansion, praised by Downing, stands on the bank of the Kennebec, and is occupied by his descendants. The following sketch of Robert Hallowell Gardiner is written by his grandson, of the same name :

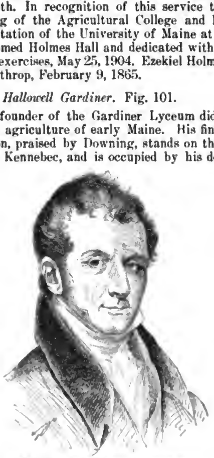


Fig. 101. Robert Hallowell Gardiner.

"George Gardiner settled in Aquidneck, R. I., in 1635. His great grandson, Silvester, studying medicine in Europe, established himself in Boston, where he accumulated a large fortune and invested widely in Maine lands, directly and through the Plymouth Company, owning the Kennebec Purchase, of which he was one of the most energetic members. He owned all of what is now the city of Gardiner and the towns of Perkins, Farmingdale and West Gardiner, with a considerable part of Hallowell, Augusta, Chelsea, Pittston and Dresden, with other estates in Norridgewock, Winslow, Winthrop and Georgetown ; and spared neither time nor money in his efforts to settle and promote the prosperity of the country. His daughter Hannah married Robert Hallowell, the last Royal Collector of Boston, and became the mother of the subject of this sketch. Dr. Gardiner and Mr. Hallowell, from their position and surroundings, were naturally Tories and went to England on the evacuation of Boston by the British troops.

"Robert Hallowell was born then at Bristol, Feb. 10, 1782. Dr. Gardiner had long hoped to found a great estate, after the English pattern, at what is now Gardiner. Disliking the political and religious views of this eldest son, he entailed this property, a tract six miles on the Kennebec river and running eleven miles back, excluding his eldest son. At the age of five, the boy, Robert Hallowell, succeeded to this estate. He was a sickly child, and it did not seem wise to spend money in developing a property which would pass to others on his death. The Revolution had checked Dr. Gardiner's efforts for the promotion of the development of his lands, and this minority made a further interruption.

"The Hallowells returned to Boston in 1792, and Robert graduated second in the class of 1801, at Harvard. On coming of age, he complied with Dr. Gardiner's will by adding the name of Gardiner, and devoted himself to the settlement of his property, having previously taken a trip through England and France to study agriculture and manufacturing. His first step was to break the entail, which he considered un-American and not democratic. By firmness and fair dealing he soon made satisfactory settlements with the numerous settlers who had squatted on his lands, and began at once that career of liberal outlay which so largely aided to build up the town and the surrounding country, participating in every movement which had for its end the promotion of religion, education, trade, manufactures, agriculture, facility of intercourse, or general development. He founded the first savings bank in his part of the state, one of the earliest Sunday-schools in the country, was an overseer of Bowdoin College, president of the Kennebec Bible Society and of the Maine Historical Society, and was for more than forty years the leading layman of the Episcopal church in Maine and one of its delegates to the General Convention of that church in the United States. He served in the state legislature and was the first mayor of his city. Though not himself a practical farmer, he took a deep interest in promoting agriculture, fostering agricultural societies and seeking to make the farm which he reserved for his home a model, by introducing superior breeds of animals, improved machinery, and valuable fruits and grains. He conceived and founded the Gardiner Lyceum, and was its most liberal supporter until financial difficulties compelled him to give it up.

"For more than sixty years he lived on his estate, with visits to Boston, New York and Philadelphia, where he sometimes passed the winter. He died March 22, 1864."

III. The Seminary at Derby, Connecticut

An "agricultural seminary" was opened at Derby, Connecticut, in the spring of 1824. It also provided for co-education. It was founded by Josiah Holbrook and Truman Coe. It was discontinued after one or two years. The following account, from the prospectus, explains the scope of the institution: "The exercises designed are the study of the Latin, Greek, French and English languages, Rhetoric, Elocution, Geography and History; the mathematics, as Arithmetic, Algebra, Geometry, Plane and Spherical Trigonometry, Mensuration and Fluxions; Natural Philosophy in its various branches; Astronomy, Chemistry, Mineralogy, Botany and Zoölogy. No effort will be spared to render these sciences practical and fitted to common life. With that view, particular attention will be given to Composition, Declamation with extempore debates, the uses of Mathematics in common business, Practical Surveying, the application of Natural Philosophy to various kinds of machinery and agricultural instruments; testing the principles of chemical science in mixing and preparing soils, farming manures, making cider, beer, spirit and various other articles of agriculture and domestic economy, agricultural, geological and botanical excursions into various parts of the country, examining and analyzing soils, and practical agriculture.

"One prominent object of the school is to qualify teachers. The most approved methods of instruction will be introduced, and lectures will be given on most of the Physical Sciences, attended with demonstrations and illustrations sufficiently plain and familiar to admit of their being introduced into common education. Courses on Natural Philosophy, Chemistry, Mineralogy and Botany will commence at the opening of the Seminary. Ladies will be admitted to the lectures, and there will be a department connected with the Institution where females can pursue any branch of education they may desire."

A memoir of Josiah Holbrook gives the following information: "The number of scholars of both sexes during the summer of 1824, was perhaps 50 or 60; among whom were five boys from New Haven, about as many from New York, and some from other places near and remote. The school was certainly an attractive and pleasant one, and those who were so disposed made good progress in useful learning. Several of the boys were instructed with surveying and leveling instruments and used them frequently and successfully. Mr. Coe gave special attention to the Mathematical studies, and Mr. Holbrook gave lectures and instruction in Natural History and allied subjects. The boys rambled extensively over the hills of that region, did some work in hoeing and digging potatoes and in making hay, and once made a pedestrian excursion for minerals to Lane's Mines in Monroe.

"The working of the school was harmonious; a spirit of study generally prevailing among the pupils, and the supply of outdoor exercises and sports was ample."

Josiah Holbrook.

Josiah Holbrook "was the son of Col. Daniel Holbrook, of Derby, where he was born in 1788. Colonel Holbrook was an energetic, prosperous farmer, and a man of wealth and extensive influence. His son received the ordinary common school education of the day, fitted for college under Rev. Amasa Porter, of Derby, entered Yale college in 1806 and was graduated in 1810. On the death of his father and mother, about 1819, the care of the farm devolved upon him, and it was during the period occupied in this vocation that the ideas which were the central ones of his subsequent labors first occurred to his mind.

"Acting on these views he opened, about that time, on his own farm in connection with Truman Coe, then a teacher, one of the first schools in America which sought to teach a popularized form of natural science, and to combine manual labor with education. Boys in this school were allowed to pay a portion of their expenses by laboring on the farm."

Statements from Truman Coe to a son of Mr. Holbrook, give the following additional information about Josiah Holbrook and the school: "He had long cherished the idea of endeavoring to found an institution in which the course of instruction should be plain and practical: an agricultural school where the science of chemistry, and mechanics, and land-surveying should be thoroughly drilled into the mind of the pupils by practice. With these views the Agricultural Seminary was commenced in Derby in 1824, and continued to the fall of 1825 under the direction of your father and myself, and as far as I know, was the first educational movement of the kind in all that region. But the institution, being unendowed and on a private footing, labored under many embarrassments, especially in never having land enough to accomplish the ends of its founders. We did what we could to train the students in the *analysis of soils*, in the application of the mechanical powers to all farming operations, and took out our young men often into the field and country for practical surveying, geological excursions, road-making, and the labors of the farm, but, not being able at that time to place the school on an eligible foundation, it was abandoned."

Later Mr. Holbrook turned his attention to the formation of lyceums or associations of adults for education and self-help. His ideal at first was a large number of local lyceums associated together and forming as a whole the "American Lyceum." Later he conceived the idea of a "Universal Lyceum" to introduce and bind together various national Lyceums. He spent the remainder of his life in laboring along these lines, working in and about Boston, New York, Philadelphia and Washington. While at the latter city he made, in May 1854, a journey to Lynchburg, Va., and while collecting minerals from the face of a precipitous cliff, lost footing, fell into the river and was drowned.

In 1857, Mr. Holbrook published a booklet on "Agricultural Geology." Issues were also announced on "Agricultural Botany" and "Agricultural Zoölogy." "The aim of all will be," the announcement runs, "to apply the simple elements of science directly to the interests of the farmer, and for the special benefit of farmers' sons—and daughters, too—to fit it for schools, especially Family Schools."

Truman Coe.

The Rev. Truman Coe was "born in Derby, December 9, 1788, and obtained his early education mostly in the shoe-shops at the old Coe place on Sentinel Hill. While at work on the bench he always kept his book before him, making daily progress in a single study at a time. After learning his trade he commenced school-teaching, which occupation he followed some years with much satisfaction in the public school and academy at Up Town, and afterwards was engaged with Josiah Holbrook in the agricultural college on the Holbrook place Yale College conferred on him the degree of A.B. About 1828 he entered the ministry in the Congregational church when forty years of age. He was a logical and entertaining preacher and in classical learning is said to have been ahead of his time. He exerted a strong moral, religious and educational influence in Derby."

IV. OTHER EARLY EXPERIENCE IN CONNECTICUT

Without attempting any full search for other movements in Connecticut, we may mention two that are worthy of special comment. The evolution of agricultural education at Yale is treated in a subsequent article

Trinity College.

An agricultural department was organized at Trinity (then Washington) College, Hartford, Conn., at the time of its foundation in the middle eighteen-twenties. In the first catalogue, an announcement by the board of trustees, dated August 10, 1824, was as follows: "An Agricultural establishment will be connected with the institution, and the students will have an opportunity of becoming acquainted with this primary art of living, by the courses of lectures, illustrated by the practical operations of farming and gardening. Military exercises will also be embraced in the system as a healthful occupation for some of the hours usually devoted to recreation."

Horatio Hickok, A.M. (Yale, 1798), is named in this catalogue as Professor of Agriculture and Political Economy. The minutes of the trustees show that Professor Hickok resigned at the close of the academic year, 1825–26, but there is no evidence of the actual conduct of the work.

In an announcement made by authority of the trustees, in 1825, is the following: "As Agriculture is the primary source of life and subsistence, and as the knowledge of it is highly useful to men of almost every profession, it is designed to make it an important branch of education. It will be the province of the Professor of Agriculture to explain the nature of different soils, and their adaptation to the growth of particular vegetables; the structure of plants and the functions of the several vessels by which they receive and elaborate their food, and their change into vegetable matter; the nature and operation of different manures, the proper succession of crops, and all the means which conduce to the melioration of the soil. These, and other theoretical instructions will be illustrated by all the practical operations of husbandry. Healthful and instructive occupations will thus be found for many hours which would otherwise be devoted to amusement, productive only of idle or dissipated habits; and an interest will be given to the pursuits of science, and our youth will acquire a taste for the active business of life, and will go forth fitted to become useful members of society."

These two citations are extremely interesting and significant, appearing in the catalogue of an institution founded primarily for religious instruction. Apparently, the men who started this college eighty-five years ago were possessed of long vision. What led to the break-down of the agricultural department, is not ascertained. It is probable that nobody wanted to study agriculture in that way at that time. It is worthy of note that a botanical garden of some extent was maintained on the college property for many years. Just when it was discontinued is uncertain, but it was under the control of Professor George Sumner, Professor of Botany, and in the early catalogues, for a considerable period, appear courses entitled "Practical Applications of Chemistry and Botany."

Cream Hill School.

At West Cornwall, Conn., a school was started in 1845 by Samuel W. Gold and his son, the late Theodore S. Gold (see Chapter X for biographical sketch of T. S. Gold). It closed in 1869. These men did all the teaching in the earlier years of the school, and undertook to teach any subject the boy desired to investigate, and fitted some for college. No work was required on the farm, but it was so managed that it was considered a privilege to work with T. S. Gold, and he usually performed manual labor one half of each day, always giving instruction to the boys that were with him on any and all subjects allied to the work in hand. The school and family all occupied the same house.

All country sports were encouraged and much outdoor life. Nature-study in a broad sense was freely made use of.

In the first notice of the school, T. R. Dutton is mentioned as interested in the school but he never had anything to do with it, and his name was dropped after the first year. The school was privately maintained. The buildings are still standing. Fig. 102 is from an old lithograph which is a fair picture but shows only the front; in the rear it is a large rambling building.

An announcement issued in 1845 makes the following statement: "This school embraces two important departments of instruction. *First.*—Thorough attention to the various elementary classical and scientific branches taught at the best academic institutions. *Second.*—Both scientific and practical instructions in agriculture and horticulture, embracing the most approved method of tillage, rearing of stock, cultivation of trees, the laying out of grounds, ornamental gardening, chemical analysis of soils, composts, etc. A portion of each day will be allotted to these objects, so that the pupil may become a scientific and practical Farmer." The farm is announced as "containing 200 acres, with convenient buildings, situated on Cream Hill, surrounded by a picturesque country scenery."

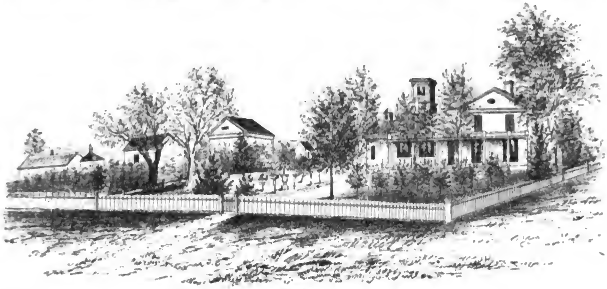


Fig. 102. Cream Hill School, from an early print.

The catalogue for 1846 contains the names of ten pupils; that of 1856 of twenty-five pupils; that of 1867 the names of 255 pupils "from the commencement of the school in 1845." The catalogue of 1846 gives the title as "Cream Hill Agricultural School"; that of 1867 as "Cream Hill Academic School, with an Agricultural Department."

V. Early Movements in Massachusetts

It is probable that movements were on foot in the early part of the last century in all the older states, looking toward the introduction of agriculture in its existing schools, and to the founding of special agricultural technical educational institutions. The history of all this discussion should be searched out and put together where we can read it. It is not the purpose of the present writing to search out all of them, but only to give enough of the history to show the trend and significance of the movement.

In Massachusetts, no separate schools or colleges of agriculture appear to have been put in actual operation, preceding the passage of the Land-Grant Act by Congress, in 1862. Much of the early discussion seems to have centered about the idea that agricultural subjects should be established in existing schools. [See Fowler, "Early Agricultural Education in Massachusetts," 54th Annual Report Massachusetts State Board of Agriculture.]

In 1824, a movement was started to create an agricultural department in the Dummer Academy, in Newbury, Essex county, but it failed. The interest in education for agriculture centering in this county (a sea-coast county north of Boston) did not subside, however. Movements were set on foot to secure state aid for this purpose in one school or another, but apparently without success. In 1838, the trustees of Teacher's Seminary, Andover, Essex county, voted that the instructor in mathematics also teach scientific and practical agriculture. Out of this effort grew the text-book by Alonzo Gray, called "Elements of Scientific and Practical Agriculture, or the application of biology, geology and chemistry to agriculture and horticulture," and published at Andover and New York, in 1842. Early in the decade beginning 1840, the Seminary was merged into the English Department of Phillips Academy. Alonzo Gray, in the preface to his book, dated April, 1842, expresses "his obligations to the Trustees of Phillips Academy, who have so promptly responded to the suggestion of preparing a text-book for the use of the Institution under their care; and who have offered him many facilities for bringing the work to a close at so early a date." Gray's was apparently the first North American text-book of Agriculture that attempted to round out and treat the subject from the science point of view. The agricultural work apparently soon ceased after the union of the two institutions. The Academy farm is now used for meadow and golf links.

The will of Stephen Harrison bequeathed the sum of $5,000 to be used in Westfield Academy, Hampden county, as soon as sufficient other funds were secured to make the instruction possible. In 1856, the selectmen and others of the town of Westfield petitioned the legislature for $5,000 to add to the bequest, and the next year the legislature authorized the inhabitants of the town to appropriate such sum. It appears, however, that the agricultural feature of the school did not develop.

Amherst College.

Various other public movements were made in the State, particularly in the direction of organizing boards to further agricultural education. Some of this discussion seems to have come out of Amherst College, which gave instruction in agricultural chemistry as early as 1843-4, and which in 1852 offered agriculture as a part of a separate "scientific department" which it then organized. In this department, Rev. J. A. Nash taught the agriculture, and he prepared a text-book (pages 381, 383). In this scientific department, Dr. W. S. Clark was professor of analytical and applied chemistry. He later became the third president of the Massachusetts Agricultural College at Amherst, a wholly separate institution. The year 1856-7 appears to have terminated the scientific department of the Amherst College. We shall resume the thread of this narrative when we discuss the rise of the state colleges of agriculture in a succeeding article.

The Farm School.

An interesting institution in Massachusetts is the Farm School on Thompson's island, in Boston harbor. On January 27, 1832, a meeting was held in Boston to consider the condition of disadvantaged and indigent children. The sense of the meeting was expressed in the following resolution: "That the establishment of a Farm School in the country, where the idle and morally exposed children of the city may be rescued from vice and danger, and may enjoy the advantages of a good physical and moral education, would be not only a great benefit to such children, but would greatly conduce to the peace and good order of this community." A "Boston Farm School Society" was organized, and incorporated by the legislature. The Society purchased Thompson's island, comprising about one hundred and forty acres of land. When the land had been purchased and buildings erected, the Society found itself short of funds. Thereupon, union was made with the "Boston Asylum for Indigent Boys," which had funds but had found its quarters in the city to be inadequate. The Asylum had been founded in 1814. In 1835, the combined institution was incorporated as the Boston Asylum and Farm School, the official name that it still bears; but it is everywhere known as the Farm School. It conducts regular agricultural and industrial operations, in which the boys take part under direction.

Bussey.

One of the earliest endowments for agricultural education of a higher grade was made by Benjamin Bussey of Roxbury, Mass., whose will, dated July 30, 1835, gave his farm of over two hundred acres and his estate, both real and personal, to Harvard University to found an institution to give "a course of instruction in practical agriculture, in useful and ornamental gardening, in botany, and in such other branches of natural science as may tend to promote a knowledge of practical agriculture and the various arts subservient thereto and connected therewith." The will was probated in March, 1842. On this foundation the present Bussey Institution is established.

Smith's Agricultural School.

An agricultural school of a novel type is now coming into being at Northampton, Mass., as a result of a bequest made by Oliver Smith, who died at Hatfield, December 20, 1845. He bequeathed $30,000, which was to be accumulated for sixty years "by annually adding the interest growing out of the same to the principal." The fund was directed to be paid over, at the appointed time, to the town of Northampton, "for the purpose in the first place of purchasing a Farm, or a tract of land for a Farm, within the limits of the said town, for a pattern farm, to be so improved in practical details as to become a model, as far as can be effected by time and experience, to farmers generally. And, in the second place, for the purpose of purchasing another farm, or tract of land for a farm, as near to said Pattern Farm as may be within said town, to be designated for an Experimental Farm, to aid and assist the labors and improvements of the Pattern Farm in the art and science of Husbandry and Agriculture. . . . Secondly, There shall also be established on the premises a School of Industry for the benefit of the poor. The boys to be selected as beneficiaries and pupils shall be of fair character and shall be taken from the most indigent classes of the community, and shall receive a good common school education, and be instructed in the art and science of agriculture, or in some mechanic art in the shops attached to the premises. . . . Fourthly, the establishment shall be designated and called Smith's Agricultural School."

Oliver Smith, founder of the Smith Charities, was an uncle of Sophia Smith, who founded Smith College. The end of the sixty years during which Oliver Smith willed that his original fund should accumulate came December 22, 1905. On that date the fund amounted to $310,660.39. Of this sum, $50,000 was turned over to the trustees for the purchase of "farms," or "lands for farms," Oliver Smith having provided that land might be secured which should be made into a "Pattern Farm," and land which should be used for an "Experimental Farm" by those who were required to give instruction on the "Pattern Farm." The site for the new school is within the city limits of Northampton, about one mile from the City Hall. It includes ninety-eight acres and cost $20,000. The first building will cost $54,000, with $10,000 additional for equipment.

The school is coöperative between the Smith grant and the city of Northampton. The Smith's Agricultural School and Northampton School of Technology has been established by the city of Northampton, aided by the Oliver Smith bequest, and in coöperation with the Massachusetts Commission on Industrial Education. Instruction will be provided in agriculture, household economy, and mechanic arts. The school will be open to boys and girls fourteen years old or older. Pupils from other towns than Northampton may attend the school if approved by the Commission on Industrial Education, and tuition on their behalf must be paid by the towns in which they reside. Towns paying tuition, however, will recover 50 per cent of the amount paid from the state. It is expected to receive pupils in the fall of 1908. The school is to be co-educational.

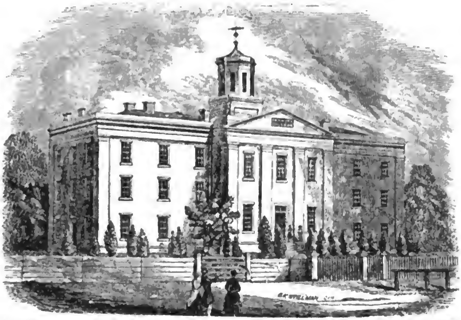


Fig. 103. Farmers' College. Cut reduced from an engraving in third annual catalogue, 1849.

VI. The Institution at College Hill, Ohio

Farmers' college, at College Hill, Ohio, six miles from Cincinnati, seems to have been the first American institution bearing the name of college, and continuing through any series of years, to give real attention to agricultural matters. It was not a college of agriculture as the term is understood at the present day; but it made a sustained effort, under the condition of its time.

The institution started as a private literary academy in 1833, Mr. F. G. Cary, its founder, taking four pupils into his own family. "The enterprise meeting with favor," runs an account published by the institution in 1853, "a small detached building was erected, and, with the increased demand for additional accommodations, other and more commodious were, from year to year, provided. The first academic year closed with twenty-eight pupils; the second with forty; the third with fifty-eight, and so on, steadily increasing every year during the existence of the Academy. For several years the catalogue exhibited an average of more than one hundred pupils; many of them well advanced in the classics and higher mathematics." It was known as Pleasant Hill Academy.

The courses of study.

In the winter of 1846–7, the institution was enlarged and reorganized under the name of "Farmers' College." The institution was not designed, at this time, to be a technical agricultural college, but to offer a general training with particular application to practical affairs. "It will be seen by an examination of the above course," says the announcement in the second annual catalogue, 1848, "that, in its parts and as a whole, it is highly practical; and that it is arranged to meet the wants of a large class of young men who wish to become teachers or efficient business men, who have not the time, money or inclination to take the long classical course which is made requisite to secure the honors of any of the regular colleges." A three-years' course was given in the "college proper." This catalogue announces the following faculty:

F. G. CARY, A.M.,
President, and Professor of Moral Philosophy and Rhetoric, and Superintendent of Buildings, Grounds and Finance.

R. H. BISHOP, D.D.,
Professor of History and Political Economy.

J. W. SCOTT, D.D.,
Professor of Chemistry and Its Application to Agriculture.

JOHN SILSBY, A.M.,
Professor of Mathematics, Natural Philosophy, and Astronomy.

J. G. WILSON, A.B.,
Instructor in the Ancient and Modern Languages.

G. S. ORMSBY,
Teacher of Preparatory Course.

A second reorganization was begun in 1852, for the purpose of providing "the means of educating in practical Agriculture and Horticulture such students as may desire such course of instruction, or whose parents or guardians may direct such course for them." It was proposed to equip a farm for instruction and experiment. Following is the course of study in the "Farm Department:"

FOUR YEARS' COURSE

Freshman Class

First session.

Ray's Second Part Algebra.
Bonnycastle's Mensuration of Surfaces and Solids, as applied to Artificers' Works.
Wilson's American History
Natural Philosophy.
English Composition.
Ornamental Drawing.

Second session.

Plane Geometry.
Anatomy, Physiology, and the Laws of Health.
Stephen's Book of the Farm Commenced.
Field Lectures on Agriculture and Horticulture.
Essays on Practical Agriculture.
Drawing Ground Plans and Elevations.

Sophomore Class

First session.

Plane Trigonometry and Surveying.
Davies' Descriptive Geometry.
Stephen's Book of Farm, with Field Lectures.
Isometrical and Perspective Drawing.
Essays on Scientific Agriculture, etc.
Garden Designs, Laying out of Grounds.

Second session.

Solid Geometry and Spherical Trigonometry.
Davies' Shades and Shadows, with Exercises in Drafting.
Political Economy.
English History.
Field Lectures, with Lessons from Natural History.
Essays on History, Agriculture, etc.

Junior Class

First session.

Davies' Analytical Geometry.
Olmstead's Mechanics.
Mental Philosophy.
Rural Economy (embracing Physical Phenomena of Vegetation, Soils, Fertilizers, Rotation of Crops, Meteorology, as Applied to Agriculture).
Rural Architecture.
Essays on Various Subjects.
Lectures on Farm.

Second session.

Davies' Calculus.
Robinson's Astronomy.
Elementary Chemistry.
Wayland's Moral Science.
Philosophy of History.
Landscape Gardening.
Essays on Moral Science, etc.

Senior Class

First session.

Philosophy of Rhetoric.
Civil Engineering.
Agricultural Chemistry, with Chemical Field Lectures.
Entomology, with Field Lectures.
Essays on Rhetoric, etc.

Second session.

Geology and Botany, with Field Lectures.
Coleman's European Agriculture.
Paley's Natural Theology.
Alexander's Evidences of Christianity.
Essays on Various Subjects.
Prize Essay on Agriculture or Horticulture.
Prize for the best Drawing or Model (for the Arrangement of Farm Buildings, for one or two hundred acres).

In addition to the Field Lectures, there will be, during the course, lectures on

Chemistry,
Geology and Mineralogy,
Natural Philosophy,
Sacred and Profane History.
Anatomy and Physiology, embracing the Laws of Health.

The pedagogical methods.

To carry out this work, it was proposed to raise $100,000 by subscription. Mr. Cary was relieved from the presidency of the institution in order "that he might devote himself wholly to the work of the agency." The accustomed work of the college was to be maintained, and the agriculture was to be elevated to a distinct and coördinate department. It is interesting to trace the efforts as an illustration of the early plans and struggles for agricultural education. In the catalogue of

1854-5, the following announcement was made of the "agricultural department:"

> Pursuant to the original design of the Institution, particular attention is given to instruction in those branches of Natural Science more directly appertaining to Agriculture. And we have now the satisfaction of announcing to our patrons, and to the public, that the Department for Instruction in Scientific and Practical Agriculture and Horticulture, is now fully organized under three appropriate Professorships, with a *Model and Experimental Farm*, wherewith to demonstrate and make practical lessons of Science:—THE FIRST COMPLETE INSTITUTION OF THE KIND ORGANIZED ON THE CONTINENT OF AMERICA!
>
> For this object alone, within the past year, the sum of *One Hundred Thousand Dollars* has been secured, and a Farm, most suitable to the purpose, and beautifully situated in immediate proximity to the College, has been purchased; an excellent Engineer and scientific Landscape Gardener, Mr. Maximilian G. Kern, has been permanently employed, and is now actively engaged, with an efficient force, in adjusting the grounds to the design of the Institution in that behalf. Preparations are in progress for erecting a large and beautiful structure, designed to provide ample space for Laboratory, Lecture-rooms, Cabinets, Agricultural Library, etc., with basement accommodations for the preservation of Fruits and Annuals for the Farm, and the Workshops and Machinery necessary for its demands.
>
> The *Course of Study* in this Department will be prescribed by its Principal in conjunction with the President and Faculty of the College, under the sanction of the Board of Trustees. To this Department students will matriculate, as in the College proper; and the scientific studies herein prosecuted will be available, to their full import, for a degree, on graduation; the same as though pursued in any other department of the College course.
>
> The great purpose will be to make practical the principles, and to make visible the results of those scientific laws, learned by the student in the laboratory:—To show the various methods by which to reclaim waste, and to restore exhausted lands; to increase production at the least possible expense to the virgin fertility of the soil; to demonstrate, by experiment, the best modes of culture of grains, grasses, grapes, fruits and garden vegetables; as also to show the habits and explain the culture of plants and flowers, both native and exotic. Particular attention will be given to Natural History, in all its branches; especially in relation to the growth, habits, and characteristics of domestic animals; also, to the development, habits, and characteristics of the various destructive insects, with a view to the prevention of their ravages of our fruits, and flowers, and forests.
>
> Much of the instruction will be given in the Field, and in the Botanic Garden. A minute record will be kept; the facts and results of all experiments carefully noted; and accurate reports frequently made: And, to serve as a vehicle for these, as well as other useful and interesting matter, collected from other sources, a *Monthly Journal* will be established, to be issued from the College.
>
> The *Experimental Farm* will be made the theatre for exhibiting, systematically, and contrasting fairly, the merits of the various seeds, etc., received from the United States Patent Office, and from other sources, domestic and foreign; and when their merits are experimentally determined, they will be held for distribution throughout the country, accompanied with a full and explicit history of their habits, growth and culture.
>
> While aiming essentially to the attainment of the practical and the useful, in the arrangement of the grounds for fruitage and flowers, into garden and grove, into lakelet and lawn, we will, nevertheless, be carefully studious of securing the beautiful. In this manner the Farm itself must become a place of interest to both the admirers of the useful, and the lovers of the beautiful. Here, Botany will be taught, not as a mere catalogue of difficult names, but as embracing the principles of vegetative organism, and the laws of vegetable life. In Chemistry, the student will not only be instructed in the principles of the science, but will, also, be exercised in the Laboratory, be made familiar with the apparatus, and be taught to manipulate in the analysis of soils, their products and their fertilizers.
>
> While it forms no part of our plan to make this a "Manual Labor Institution," so called, yet the demands of the Model Farm itself, will furnish, to any student desiring it, an opportunity for employment in such manner as to contribute to both health and pecuniary profit. For, though the regular class-proceedings in scientific experiments, on the farm, in the garden, and in the orchard, as in the laboratory, will be, of course, without pecuniary recompense to them, yet there will be very much to be done, not falling within the purview of the studies of the class, which any student may, at his option, find employment in, and receive therefor his proper renumeration.

It was further said, as an attraction to the prospective student, that "Farmers' College, with its ample grounds, occupies as its site the highest point of land in the Miami country, is in proximity to Cincinnati, the commercial metropolis of the West, and in the geographical center of Hamilton county, the most wealthy and populous in the state. A refined, intelligent, and moral community sheds its influence around the institution; the Ohio Female College, with its lovely site and beautiful buildings, is situated on a neighboring eminence, while, for purity of air, and for beauty and variety of landscape scenery, the location is unrivalled."

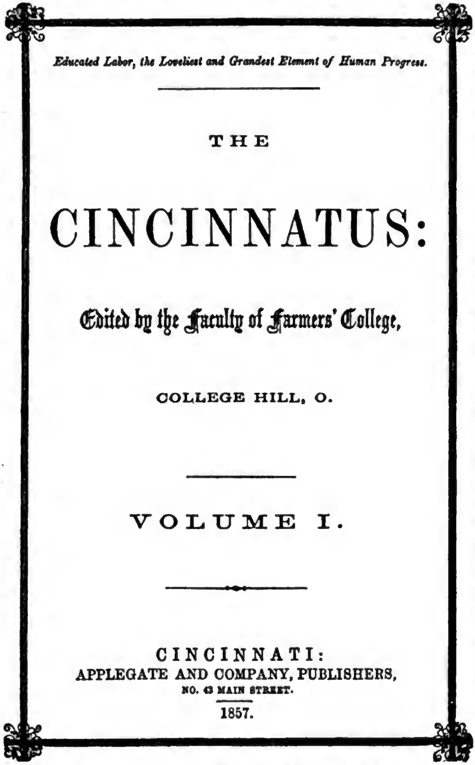
The Cincinnatus.

The "monthly journal" was given to the world January 1, 1856. It was "The Cincinnatus, edited by the faculty of Farmers' College, College Hill, Ohio" (Fig. 104). It was a sixty-four-page magazine, devoted to matters of agricultural education and experiment, rural economics, farm work and theory, and rural science and practice in general. It is a most entertaining and inspiring journal, even to present-day readers.

The Cincinnatus was continued five years. In 1861, it became "The Cincinnatus, and Journal of the American Patent Company."

Subsequent history.

For several years, under the leadership of Cary, the agricultural department appears to have thrived; but in the sixties the interest seems to have begun to wane. The sessions of the college were suspended from 1870 to 1873, "on account of the discouraging effects of the Civil War." Resuming, in the catalogue of 1873-4, the name of John A. Warder, known of every horticulturist, appears as "Cary Professor of Theoretical and Practical Agriculture," and the following announcement is made of his incumbency: "In the Catalogue of 1873-4, the 'Cary Professorship' is announced. For this Department the Board have been able to secure the services of Dr. John A. Warder. Dr.



Educated Labor, the Loveliest and Grandest Element of Human Progress.

THE

CINCINNATUS:

Edited by the Faculty of Farmers' College,

COLLEGE HILL, O.

VOLUME I.

CINCINNATI:
APPLEGATE AND COMPANY, PUBLISHERS,
NO. 43 MAIN STREET.
1857.

Fig. 104. Title-page, exact size, of the first American College Journal of Agriculture. Although the page bears the date 1857, the volume was really for 1856.

Warder's devotion to this department in all its various divisions, embracing the productions and culture of field, forest, garden and lawn, including pomology, and our varied Flora as well, is so generally known that no word of commendation from us is needed to designate him as the right man in the right place. To the rich stores of knowledge he has acquired at home by years of study, travel and experience, he now adds the results of his observations and study in Europe, on his recent tour in the service of the Government of the United States as Commissioner to the World's Exposition at Vienna."

In 1884, Farmers' College became Belmont College. On December 31, 1889, the Ohio Military Institute was chartered, and in the following September this institution was opened on the old site at College Hill, and it still continues.

Freeman Grant Cary (Fig. 105).

Cary was the moving spirit in this school, developed in the young and growing West. His cousins, Alice and Phœbe Cary, have left us pictures of the region in their Clovernook Stories. The Editor is indebted to the late Samuel F. Cary, a younger brother, for the following sketch. This younger brother was himself widely known as publicist, educator and temperance lecturer. "Freeman Grant Cary was born in Cincinnati, April 7, 1810. He came of Puritan stock, his ancestor, John Cary, being one of the founders of the Plymouth Colony. When he was four years old, his parents moved to the village of College Hill, then a wilderness. He was graduated at Miami University, Oxford, Ohio, in the class of 1831. He started a classical school, Cary's Academy, in 1833. He was a popular instructor and a large number of young men sought admission to the school, and he soon had more applicants than he could accommodate. The farmers in the surrounding country held a meeting and agreed to erect suitable buildings and let Mr. Cary have the use of them. They obtained a charter from the state legislature, and gave the institution the name of Farmers' College, from the course of instruction and the fact that the greater number of its patrons were farmers. A tract of land was purchased and laboratories were erected for the analysis of soils and fertilizers, and practical demonstrations were given in raising different varieties of trees, shrubs, fruit and vegetables, in budding and grafting. My brother resigned the presidency of the college to take charge of the agricultural department, which was not continued many years for want of funds. The institution was founded on the scholarship plan, which proved not to be successful nor practicable. In the height of its prosperity, there were more than three hundred pupils in attendance. It flourished until the time of the Civil war, when its numbers were diminished, and it never regained its old footing. The directors thought as the character of the institution had changed, a change in name might be beneficial, and for a time it was called Belmont College, and finally it merged into the Ohio Military Institute. My brother severed his connection with the institution in the fifties, and moved to a farm near Hamilton, Ohio, where he had an opportunity to gratify his taste for agricultural pursuits. He was an enthusiast in his line. He died at the age of seventy-nine, in 1888, of heart failure, never having had a day's illness." No more fitting sentiment can be associated with Cary's name than the following sentence, which he wrote in "The Cincinnatus" in 1857, when speaking of the newly founded agricultural college of Michigan: "We trust it is the mission of American Institutions to enlarge the platform of a University education, until it shall embrace the liberal education of men for every honorable calling and pursuit, and let it be our zealous endeavor unitedly to labor to effect so desirable a consummation."

Fig. 105. Freeman Grant Cary.

NOTE.—The above account of Farmers' College was written by the Editor ten years ago from original sources, but never published. Since the account was put in type, the Editor has received "Historical Sketch of Farmers' College," by A. B. Huston, chairman of Publication Committee of the Students' Association of Farmers' College, a book of 175 pages, published sometime subsequent to 1902. The two accounts have not been compared.

VI. THE SECOND ATTEMPT IN OHIO

The "Ohio Agricultural College" was opened in Oberlin, northern Ohio, in 1854. It continued one year at Oberlin and two years at Cleveland. The largest attendance was about forty students. It did not grow, and therefore was discontinued. Dr. Townshend, one of the lecturers, then went to Columbus and urged the State Board of Agriculture to endeavor to secure aid from the legislature. It was suggested that $3,000 be asked. The Board did nothing and the matter was dropped. The late George T. Fairchild, writing in 1897, speaks as follows of this venture: "A course of winter lectures for farmers was organized about fifty years ago in Cleveland, Ohio, under the leadership of the lamented Dr. Norton S. Townshend, later professor of agriculture in the Ohio State University. Some of the best educators in the region were associated in the work. An older brother of mine, then and since connected with Oberlin College, carried the literary part of the work, with the earnest hope of opening to farmers of the Western Reserve the treasures of pleasure and of power in the world's best thoughts. This lecture-course failed for lack of patronage, as well as lack of endowment, just as other good enterprises have failed."

This Oberlin school apparently opened the way, through Dr. Townshend, for the establishment of regular agricultural work as a part of the Ohio State University, at Columbus.

To show the scope of this early attempt at agricultural education, the original announcement is here transcribed in full:

OHIO AGRICULTURAL COLLEGE

Oberlin, Loraiu Co., Ohio

References

Prof. J. P. Kirtland	Rockport, Ohio
Thos. Brown, Editor Ohio Farmer	Cleveland, Ohio
Dr. Sprague, Secretary State Board of Agriculture	Columbus, Ohio
Gen. J. T. Worthington	Chillicothe, Ohio
Dr. Warder, Editor Western Horticultural Review	Cincinnati, Ohio
M. B. Bateman, Editor Ohio Cultivator	Columbus, Ohio
Col. S. D. Harris, Editor Ohio Cultivator.	Columbus, Ohio
Hon. H. L. Ellsworth	Indiana
J. C. Holmes, Secretary State Board of Agriculture, Mich.	Detroit, Mich.
Col. Ware	Berryville, Va.
Dr. Kennicott	Illinois
D. D. T. Moore, Editor Rural New Yorker.	Rochester, N. Y.

The Object

To place within the reach of Farmers, both old and young, the means of acquiring a thorough and practical acquaintance with all those branches of Science which have direct relations to Agriculture.

Plan

It is proposed to give Courses of Lectures during the Winter months, on all the several departments of Agricultural Science, each principal division being assigned to a different Lecturer, and systematically presented in the same manner as Medical Science is taught in Medical Colleges.

Advantages of the plan

It is adapted to meet the wants of the present as well as of the rising generation. It is proposed to occupy only the Winter months, when the farmer himself, or his sons, may best spare the time.

It presents a view of the whole field of the Sciences connected with Agriculture, in the shortest period of time, and therefore makes their acquisition possible to multitudes who could not attend Universities, or even Schools on experimental farms.

Subjects

The branches taught will embrace whatever pertains to Animals, Vegetables, Land or Labor.

Lecturers

James Dascomb, M.D. Chemistry, in all its applications to Soils, Manures, Animal and Vegetable life, and the Domestic Arts, etc.

This department is regarded as especially important, and means have been provided for its thorough illustration.

Norton S. Townshend, M.D. Comparative Anatomy and Physiology, with special references to the feeding and breeding of Stock; History and Description of Domestic Animals in their several varieties; Veterinary Medicine and Surgery; Entomology.

This department will be illustrated by preparations and specimens, and by the practice before the class of such operations as are necessary to be performed by the keeper of stock.

John S. Newberry, M.D. Geology and Mineralogy; Botany, Descriptive and Physiological, with special reference to the history and habitudes of Plants cultivated in the Garden and Orchard, or in the Field—the various modes of Culture, and Soils adapted to each.

This department will be illustrated by specimens of all the varieties of Grains, Fruits, and other vegetable products of interest to the Farmer, Gardener, or Orchardist.

James H. Fairchild, A.M. Natural Philosophy; Agricultural Mechanics; Farm Implements; Meteorology; Elements of Engineering and Land Surveying; Rural Architecture; Landscape Gardening, and Farm Book-keeping.

Philosophical Apparatus, Implements, Models, Plans, Drawings, etc., will be abundantly provided, to aid the Lecturer in this department.

The Lectures will commence on the first Monday in December, and continue three months. Four lectures will be given daily.

Additional Facilities

A Reading Room, supplied with the principal Agricultural Periodicals, will be open to students at all hours. They will also have access to an extensive Library.

Terms

For the entire Course $40 00

Board and rooms may be obtained at two dollars per week, exclusive of fuel and lights.

This Institution is designed to be permanent, and is therefore incorporated as the Ohio Agricultural College. It is located at Oberlin, Lorain county, Ohio.

Oberlin is easily accessible by the Cleveland and Toledo Railroad. It is only one hour's ride from Cleveland.

Letters of a business character may be addressed to Dr. J. Dascomb, Oberlin, Ohio.

September, 1854.

VII. Early Movements in South Carolina

One of the earliest responses to the demand for schools of "manual labor" came in South Carolina. In Meriwether's "History of Higher Education in South Carolina" issued by the United States Bureau of Education, it is stated that "in South Carolina the first manual-labor school in the United States was founded on a bequest of Dr. John De La Howe, of Abbeville county, who, in 1796, left the bulk of his property for the purpose of establishing an agricultural school." The state legislature in 1829 took charge of this school and made the funds secure, appointed the trustees: Alexander Hunter, James Alston, Rev. John F. Pressley, Dr. John Logan and James A. Black. The institution had both money and real estate, and still controls good property. Legislation in regard to this school may be found in the Statutes of South Carolina, Vols. 5 and 6. The school has been a success, lasting through the hundred years of its existence. The following is from the American Farmer, 1831: "We have no information of the character of the deceased, nor of his wealth or will, but what is contained in an advertisement which we find in a South Carolina paper. By this advertisement it appears that provision is made in the will of the late John De La Howe for the education of twenty-four poor children, twelve boys and twelve girls. The trustees appointed to carry the will into effect, advertise for a teacher to superintend a farm school as planned and provided for in the will of the deceased. They have provided a good farm, suitable buildings, utensils, provisions and necessary stock, and offer a liberal salary for a teacher. According to the plan of the school in the will, the children will live together in one family, and the expenses are to be defrayed out of the funds of the estate with the addition of the labor of the children on the farm."

The School at Pendleton.

Within four miles of the town of Pendleton, on Mr. R. F. Simpson's plantation, there was in existence a "manual labor" school between the years 1830 and 1835, which was taught by Rev. J. L. Kennedy. It was a boys' school and the pupils were taught agriculture, carpenters' work and the like. It was designated "The Labor School." Mr. Kennedy was a successful teacher and some of the most noted public men of those days were pupils under him. His name stands prominent in the history of the state.

The Agricultural Society.

The demand for direct agricultural education also began early in South Carolina. This was a natural consequence of the early organization (1785) of an agricultural society in that state. In the second volume of the Southern Agriculturist (1829) appears a communication from the South Carolina Agricultural Society, written by "a well-wisher of agriculture" (probably Dr. Legare, the editor), pleading for agricultural education. "The

Agricultural Society of South Carolina," the writer urges, "should establish a School, to be called the Agricultural Institute;" there should be a lecturer on mechanics and mechanical philosophy, a lecturer on agricultural chemistry, and "a teacher who should demonstrate practically the principles pointed out in the foregoing lectures, as well as give a history of different domestic animals and the manner of keeping and raising them."

The establishment of an agricultural school had been predicted in a speech by W. B. Seabrook delivered before the United Agricultural Society of South Carolina, and reported in the Southern Agriculturist in 1827. The South Carolina Senate at this time had a bill pending to carry out the suggestions contained in this speech of Mr. Seabrook, and the Committee on Agriculture reported it to the Senate with a recommendation that it pass, and that a chair of Agriculture be established in the State College located in Columbia, now the University of South Carolina. This bill, however, failed to pass, although the great majority of Senators were planters. At the same time the President of the College presented the scheme to the Board of Trustees, viz., that a chair of agriculture be established in the college, but the Board, which consisted largely of lawyers, replied to the President's request by saying that the only way to learn agriculture was between the plow handles, and that measure also failed.

In 1838, Dr. Thomas Legare made the following plea for an agricultural school in an address before the South Carolina Agricultural Society: "Efforts are now being made to excite an esprit de corps among the planters of the South by inspiring them with a consciousness of the dignity of their claim upon the legislative consideration of the State, that they move on in one undivided phalanx to the councils of their country and demand an appropriation of a portion of the revenue toward the establishment of an agricultural professorship at the college under the patronage of the State, and to incorporate a system of agricultural education into the elementary course of our free schools."

These early movements in the South appear not to have produced definite results; but they indicate that persons there, as in the North, had long vision.

VIII. Various Other Private and Local Agricultural Schools

The agitation for agricultural schools had become widespread before the idea of the public school had become fully established. Academies and other schools were fields for private promoting and investment. The agitation for agricultural training had become so pronounced that many private enterprises took advantage of it to organize schools. Into these schools were incorporated more or less of the new doctrines of manual labor, application of science, training for occupation, democracy of education, while usually holding in the main to the classical or literary routine as a framework or background. Some of these institutions were no doubt more or less speculative. Some of them were pretentious in their announcements, and were likely to assume the name of college, but they were what we would now call private schools.

It will not be necessary to try to make any complete catalogue of such schools. They were many. In many cases, the old-line academy probably added a course of lectures or study on agriculture as an advertisement. If one is interested in these early sporadic agricultural enterprises, he may trace them by consulting the advertising columns of the press of the time.

As early as 1829, a prospectus announced the "Woodbridge Scientific and Practical School" at South Hadley, Mass., in which it was the purpose to convert "the ordinary exercises of a gymnasium into some useful and lucrative channel." Instruction was announced to prepare those designed for mercantile or agricultural pursuits, or any of the useful arts, to enter on their occupations well furnished with useful knowledge, and acquainted with their business as far as possible by practical experience. From one to two hours a day were to be devoted to practical agriculture or to the workshop. A site for a garden had been chosen, and opportunities were to be offered for acquiring a thorough practical knowledge of the science of horticulture.

Fellenberg Schools.

In 1831, the "Association of the Fellenberg System of Education" (see page 356), under the superintendence of F. A. Ismar (late from Hofwyl), was in operation on Bolton Farm, near Bristol, Bucks county, Pa. The object of the Association was "to establish a school in which classical learning will be omitted, for boys between the ages of ten and twenty years, to be instructed in theoretical and practical agriculture, the sciences connected with it, and the machine arts; and also a school for the preparation of teachers who may extend the system throughout the country." The agricultural work was announced as "now open;" charge for tuition, board, and washing was $100 per year, payable half in cash and half in produce at the market price.

The Fellenberg School at Whitesborough, Oneida county, N. Y., according to an announcement in 1831, "began with six scholars only, and soon increased to sixty, more than which number can not be accommodated. By the practice of early rising, more than the usual hours are devoted to study, while three hours of every day are employed between Agriculture, Horticulture and the Mechanic Arts. Unpretending as was its origin, and circumscribed as its capacity, and although pains had been taken to make known that the institution was filled, five hundred applicants, it is said, were necessarily rejected last year, and more than fifty during the first three months of the present year. This speaks loudly in favor of the system, even upon an imperfect and inadequate trial."

Schools of many kinds.

It is reported that an agricultural college was started very early, probably in the forties, in Columbia county, N. Y. An "Agricultural Institute" was organized at Aurora, Cayuga county, N. Y., about 1845. In 1846, several farmers of Orange county, New York, formed an association and organized the "Orange County Scientific and Practical Institute" at Montgomery. The Dutchess Agricultural Institute, near Poughkeepsie, began in 1846, under John Wilkinson. In 1848 he went to Germantown, Penna., and there became connected with the "Mount Airy Agricultural College."

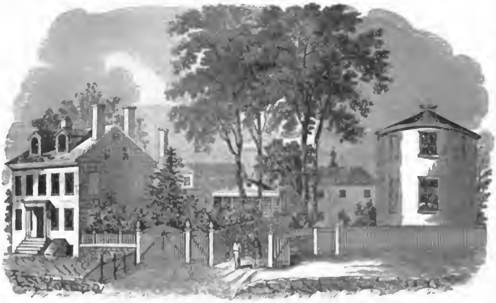


Fig. 106. Mt. Airy Agricultural College, from a print of the time.

The Mount Airy Agricultural College (Fig. 106) was announced in 1847 by James Gowen: "To educate youth in the leading branches of popular learning as taught in our colleges, with the addition of practical and theoretical agriculture and horticulture, with their attendant sciences, the undersigned contemplates founding an agricultural college at Mount Airy, his residence, eight miles from the city of Philadelphia." Students were admitted at ten years and upward; terms $200 per annum, for board and tuition. A person now living, who visited the institution in 1849, speaks of it as "a small private school." It had ceased in 1855, and perhaps earlier.

In 1843 the "Eden Hill Farm Institute," twelve miles above Philadelphia, on the Delaware river, was in operation. The farm was owned by J. Coperthwaite, and James Pedder, editor of the "Farmer's Cabinet," was connected with it. B. G. Noble announced in 1843 that he was about to establish at Bridgeport, Conn., an "Agricultural Institute," to provide "a system of education adapted to the wants of those youth who may be designed for the pursuits of agriculture." In 1846, Gardner G. Howland, of Flushing, Long Island, offered the American Agricultural Association the use of his farm of 300 acres, all stocked, for five years free of charge, for the purpose of establishing an agricultural school. In the same year, Dr. Daniel Lee, editor of the second "Genesee Farmer," in cooperation with Gen. Rawson Harmon, opened an agricultural school at Mr. Harmon's residence in Wheatland, Monroe county, New York. The farm contained 200 acres of improved land. An agricultural school had been in operation for some time near Nashville, Tenn., when in 1844 a charter for an agricultural college was secured from the legislature. The institution was named Franklin College, and the first session, under the new name, was opened January 1, 1845, with about fifty students. The school was in charge of T. Fanning, editor of the "Tennessee Agriculturist." In 1856, an agricultural school was in operation in Loudoun, Va.

A good illustration of some of these schools is given in the following statement by Professor W. H. Brewer: "In the winter of 1850 to 1851, some gentlemen of Buffalo undertook to establish an agricultural school at Lancaster, a small hamlet in Erie county, ten miles east of Buffalo, on the farm of Judge Burwell, who was the originator and chief mover of this scheme. As in most of these earlier attempts at agricultural schools, the material foundation was to be in stock, subscribed for the same as stock for any other corporation.

"The 'Oakwood Agricultural Institute' was thus founded on 200 shares of stock, subscribed by five gentlemen, who hoped to get the school started in that way, and then after it should be in successful operation to turn it over to the state in some way, so that it should ultimately become the State Agricultural College, an institution so many were then advocating and looking for.

"I was employed to take charge of the Agricultural Department. An older man was to be principal, but just before the school opened he was found to be unfit, so I had to take charge. The school opened early in April, 1851, using the buildings on the farm, a house previously occupied as a dwelling being used for the classes. We had about a dozen boys of fourteen to seventeen years of age. I soon became convinced that the school could not succeed on the plan laid out by the founders, and gave notice that I would leave at the end of my year. The school closed in the fall, and we sent the boys to their homes, and I spent the winter in giving public lectures on elementary and agricultural chemistry in that county. I delivered one course in the village of Lancaster, and another in the village of East Aurora, some eighteen miles southeast of Buffalo.

"In that winter a severe fire in Buffalo burned out three of the gentlemen, who held 196 out of 200 shares of the stock, so when I left the school at the end of March, 1852, all that remained of the Oakwood Agricultural Institute was an excavation for part of the cellar on Judge Burwell's farm, and some lithographs of the fine building that was planned to be erected."

It will not profit us to follow these general beginnings of agricultural education farther at this time; but we may stop to consider the text-book phase of the subject; and then we may trace some of the American movements that seem to have descended directly into the great state-maintained colleges. Although all these early institutions have passed away, and some of them had only the briefest existence, they all had their effect on the final issue.

DEVELOPMENT OF THE TEXT-BOOK OF AGRICULTURE IN NORTH AMERICA

A review of the development of text-books of agriculture will give us another view of the evolution of ideas associated with the rise of education by means of farm subjects. This history may be traced by making a revision and extension of an article under this title prepared by the Editor and published in the Annual Report of the Office of Experiment Stations, for the year ended June 30, 1903; which article, in turn, was based on a contribution to Book Reviews, for 1899.

A century and a half ago the ancients were still dominant authorities in agriculture. The spirit of scientific inquiry grew slowly and steadily; but it was not until the birth of the application of chemistry to agriculture, in the early years of the eighteenth century, that great progress was made in applying science to farming. Davy, Liebig, and Boussingault, representing three nationalities, are the prominent names in this early field. The principles of chemistry as applied to farming afforded a central idea around which all other agricultural questions could be crystallized. The long-hoped-for science of agriculture had come.

The types of text-books.

In the ultimate analysis of the text-books of agriculture one finds two contrasting and conflicting types of ideas—the idea of science, and the idea of business or practice. Those who conceive science to be the fundamental and controlling idea in farming, start the book with discussions of groundwork of science — chemistry, plant life, physics, meteorology. Most of the older books and many of the newer ones are of this type. Those who conceive business or practice to be the unit in agriculture, start the book with farm management as explained and aided by science. The former system is applied science, and it usually starts with heat, air, elements, chemical action, or physiology; the latter system is scientific explanation and advice, and starts with soils, plants or animals. One emphasizes the standpoint of the student, the other the standpoint of the farmer. One begins in the laboratory, the other in the field. The applied-science book may make its theme either physical science or biological science. It usually chooses the former, particularly chemistry. The early idea was to combine science with practice. The present idea is to make practice scientific or rational from the beginning.

There is a third type of text-book in which the distinctions between science and farm management are not clearly apprehended, and the work becomes a compound of the two main-type ideas.

A fourth type has come into existence in recent years, in the form of laboratory manuals, being guides to experiments and practice. These are the result of the laboratory method, that is so much thought of in our contemporaneous teaching.

To these four kinds of text-book should be added the reading-book type. The earliest agricultural school-books in this country were readers. In the later development of the subject, the reading-book has practically been ignored; but it will come back, and signs of its recrudescence are now apparent. Among the reading-books that have had great influence on children, the Willson Readers must not be overlooked. They are the "School and Family Readers" of the Harpers, devoted in large part to natural history subjects. They are historic school-books. In 1904, Marcius Willson (1813-1905) wrote the Editor as follows concerning the purpose and plan of work on these important volumes: "On leaving College (I graduated in 1836), I taught in various institutions some ten or twelve years, among them Poughkeepsie Collegiate School four years, was Principal of Canandaigua Academy four

Fig. 107. Marcius Willson.

or five years, and was offered the Presidency of Vassar College at the time of its founding, which I declined, because I was then under contract with the Harpers to write the series of readers. I was led to write that series because I saw that the readers in use were designed to be merely, and were mainly, rhetorical, when I thought they might well contain a great amount of interesting and useful information, especially in the natural history departments of a sound education, and be very much improved thereby, without suffering any rhetorical loss; wherefore I formed the plan which I afterward carried out in the School and Family series. I even went to Boston, and had a long conference with Horace Mann, detailed to him, at considerable length, my plan, although I had written nothing on the subject. He expressed his most cordial approval of my project. I was then residing near New York City, and had already written my United States History, American History, and Outlines of General History, all of which had been well received. I then had several conferences with the Harpers, and explained to them my plan for the School and Family Series of Readers. After a short time they requested me to draw up a contract for the series, which I did, and the three Harper Brothers signed it, although not a line of the series had then been written. The contract specified that the books were to be illustrated to any extent that I desired, all at the expense of the publishers. The Harpers stipulated that I should manage the introductions of the books into schools for awhile, which I did, and for which they paid me extra."

Notes on the texts.

Considered as an industry, agriculture is manufacturing, buying and selling. But unlike most other business, the operator is producer of the raw material as well as dealer in the products. In order to produce his wares to the best advantage he is obliged to know much of the principles in accordance with which the most successful production must proceed. In other words, he must know much of the sciences on which agriculture is based, as physics, chemistry, botany, and other sciences. But the practice of agriculture is an art.

These remarks will suggest why it is that there is such a bewildering diversity in plan in the various text-books of agriculture. One reason why these text-books have not been more successful in accomplishing the missions for which they were designed is probably the fact that they look upon agriculture from the academic point of view rather than from the field-practice. Another reason is the attempt to make them "practical" by inserting specific directions for the performing of accustomed farm operations; for these directions must necessarily be of local and temporary application, whereas principles are general and abiding.

More than a dozen school-books of agriculture were published in the United States prior to the passage of the Land-Grant Act in 1862. It is not possible at this time to give a complete chronology of American text-books of agriculture, for such books have not been kept and collected; but the following notes will contribute to that end, and also illustrate the development of the subject.

A very early American text-book is Daniel Adam's "Agricultural Reader, Designed for the Use of Schools," and published at Boston in 1824. The preface is dated at Mount Vernon, N. H., October 23, 1824. It is a duodecimo leather-bound book of 264 pages, containing a great number of short unrelated articles on agricultural practice and kindred topics. The preface records that "The design of a publication of this nature was formed as early as the year 1821; and it was a satisfaction, while in the prosecution of it, to perceive, that the occasion for such a publication already begins to be felt." This reference, as explained in a footnote, is to the report of a committee on crops of the Rockingham Agricultural Society and to the address of Theodore Sedgwick before the Berkshire Agricultural Society. Both these parties urged the necessity of a book on agriculture for schools.

A second early book is Taylor's "Farmer's School Book," published in 1837 in Ithaca and Albany, N. Y. This is a 16mo of 232 pages "designed as a reading book in common schools. Children may read and study in the schoolroom what they will practice when they become men. They now read the 'English Reader' or some other collection that they do not understand or feel any interest in, and which, the worst of all, never gives them one useful idea for the practical business of life." Taylor was editor of the monthly "Common School Assistant" and author of "The District School or National Education," the latter designed "to show what our common schools now are, what they ought to be, and how the people may make them such." His "Farmer's School Book" starts out with general discussions of physical science, but soon passes into consideration of farm practice and management of specific crops. The chapter on hemp was written by Henry Clay.

The third book appears to have been Judge Buel's adaptation of General Armstrong's "Treatise on Agriculture," 1839. There is no internal evidence that this work was designed for the schools, although it was adaptable to that use, but it was one of Harper's School District Library. The original edition was published anonymously "by a practical farmer," in 1820, in Albany. It first ran as a serial in the Albany Argus, Judge Buel's paper, in 1819. Gen. John Armstrong was a soldier in the Revolution and, subsequently, United States Senator, Minister to France, and Secretary of War. The book under consideration treats the subject almost wholly from the point of view of farm practice, and was an excellent treatise for its day.

Judge Buel's "Farmer's Companion, or Essays on the Principles and Practice of American Husbandry," was published in 1839. The volume was also incorporated in The School Library, Vol. XVI, a series "published under the sanction of the board of education of the State of Massachusetts." The book does not appear to have been intended as a pupil's text, however.

The first distinct and professed indigenous American text-book, or treatise on agriculture, appears to have been Alonzo Gray's "Elements of Scientific and Practical Agriculture," published in Andover, Mass., and New York, in 1842. Its chief theme is life, the "vital principle," and it is perhaps the fullest analysis of the biological type of presentation that has yet appeared in our text-book literature. It gives an excellent outline, also, of the chemical wisdom of the time. It is too technical even for our present-day rural schools. It was the result of teaching in an academy (page 370).

The next book appears to have been "The Canadian Agricultural Reader," published anonymously at Niagara, Ontario, in 1845. This took up the subject in its application phases.

Another real text treatise is Davis's "Text-Book on Agriculture," copyrighted in 1847, bnt bearing the publisher's date of 1848. It is essentially a laboratory presentation of the subject. Of the eight chapters, seven are concerned mostly with chemical matters, and even the eighth chapter contains little discussion of farm subjects. A long appendix is devoted to a discussion of insects injurious to vegetation. Davis's opening sentence is this: "Chemistry is that science which makes us acquainted with the composition and properties of bodies, and the changes which take place between the particles of matter at insensible distances from each other."

Then follows Dr. Rodgers's "Scientific Agriculture," Rochester, N. Y., published in 1848, and a second edition in 1850. It is a most complete and systematic presentation of the applied-science idea, running through chemistry, geology, botany, and meteorology; and it ends with an attempt to present agricultural subjects. The highly illumined symbolic frontispiece well represents the outlook of the work—a scroll reaching from the electric heavens bearing the words "Chemistry, botany, meteorology and agriculture."

A great advance was made by Professor Norton's "Elements of Scientific Agriculture," 1850. Here there was a distinct and successful attempt to approach the subject from the agricultural viewpoint, explaining rural practices by the applications of science. But even here the advice was very largely chemical.

In 1850, a regular text-book appeared in Canada by Henry Yonle Hind. It is a chemical presentation of the subject, with many direct applications to approved practice. A second edition appeared in 1851.

In 1851, the reading-book idea again came forward in Rev. John L. Blake's "Lessons in Modern Farming." This book differs widely from Taylor's, however, in the fact that it presents the subject from the literary side, whereas the earlier book presents it from the science and farm-practice side. Blake had a great intellectual interest in rural life, as evidenced by his "Farm and Fireside," 1852, and the "Farmer's Every-Day Book," and "The Farmer at Home."

Waring's excellent "Elements of Agriculture," 1854, reminds one of Norton's book, although it is written more completely from the chemical point of view. The revision is dated 1868, but the general line of treatment remains the same; the author writes that "the observation and experience of the intervening years have sadly clouded some of these fancies [of the original edition], and the veil which hangs about the true theories of agriculture has grown harder to penetrate; the difficulties in the way of precise knowledge have not lessened with close acquaintance." This frank admission suggests the inherent weakness of the attempt to teach agricultnre as an exact physical science. To those who have learned to honor the name of Colonel Waring as that of a practical sanitary engineer and an efficient public servant, these references to his early labors in the agricultural field will afford a new source of pleasure.

Nash's "Progressive Farmer," 1854, is another chemical presentation of the subject, being even more closely confined to this viewpoint than most of its contemporaries. Chemistry and fertilizing the land are considered to be the fundamental units. (Page 370.)

Fox's "American Text-Book of Practical and Scientific Agriculture," Detroit, 1854, has the distinction of being the first text published west of New York state. The chemical features are strong, even in the discussion of the particular crops. It goes into the methods of growing the leading crops with considerable fullness. (Page 400.)

A translation (from the German) of Thaer's "Principles of Agriculture," by William Shaw and Cuthbert W. Johnson, was published in New York in 1846, 1848, and 1858. It was not designed as a text-book for schools, although it was one of the volumes of the Michigan District School Library. It was an important work in its day, of 552 large pages. (There is a note on Thaer on page 358.)

Campbell's "Manual of Scientific and Practical Agriculture," 1859, is a full exposition of the chemistry idea. The second half of the book is devoted to detailed instructions for growing the various crops, written from the farm-practice viewpoint. Animal husbandry receives liberal space.

It appeals to the Editor that the books of Norton, Waring, and Emerson and Flint are the three great historic American text-books, and of these, that of Emerson and Flint seems to come nearest to the agricultural point of view. This book sets out with the chemical theme—the composition of matter—but it quickly runs into a rational elucidation of farming by means of scientific truths. It attempts to give the underlying reasons for rotation of crops, maintaining fertility of the land, the cultivation of particular classes of plants, the management of stock, and similar true agricultural problems. It stands between the old-time applied chemistry and the new-time farm practice. The second edition of the book, with no change of plan, appeared in 1885.

The agricultural colleges began to come to the fore in the sixties. Agricultural education was given an immense impetus. Of the text-books of this early period two stand out with great distinction—the ever-admirable works of Professor Johnson, of Yale, on "How Crops Grow" and "How

Crops Feed." The former first appeared in 1868, and a new edition in 1890; the latter, which is still in its original edition, appeared in 1870. These are not text-books of agriculture, but agricultural chemistries, and they are therefore not included in the following bibliography, but they gave such an impetus to the study of the subject that no sketch of American agricultural education can be complete without a mention of them. They practically held the field alone until the appearance of Storer's "Agriculture in Some of its Relations with Chemistry," in 1887. Many books on agricultural chemistry have appeared in this country, as well as some on agricultural botany. Mention should also be made of the "Elements of Agricultural Geology, for the Schools of Kansas," by Professor William K. Kedzie, 1877, as a type of book that has been little considered for agriculture teaching.

In the modern text-books of agriculture, the agricultural point of view has been more and more emphasized, although the greater part of them start out with the theme of the composition of matter, as those of James, Lupton, Thompson, Gulley, Winslow, Wallace, Voorhees, Dawson. Of the recent texts, James' "Agriculture" is the first work since Gray's (unless we except Pendleton's) that makes life, or biology, the primary theme of the treatise. Mills and Shaw's book starts with chemistry, but it very soon picks up the farmer's point of view and discusses farm management. Pendleton's book, which is the most minute and extended American text, presents both the biological and physical science sides, making some practical applications near the end.

Official patronage.

From the earliest agitation of agricultural education, the state has been urged, directly or indirectly, to promote the enterprise. Armstrong's original treatise, 1820, was strongly commended by the New York State Board of Agriculture. "The Canadian Reader" was compiled by a vice-president of the Niagara District Agricultural Society. Norton's was a "prize essay of the New York State Agricultural Society." [See Transactions, New York Agricultural Society, 1849, page 602. Prize, $100.] Hind remarks in the second edition of his book, 1851, that "the authorities of the societies, etc.," had distributed the first edition to the extent of 379 copies. Johnston's "Catechism" was "approved by the Provincial Board of Education for use in the schools in New Brunswick." Emerson and Flint's was approved and recommended by the Massachusetts State Board of Agriculture. Ryerson's was "authorized by the council of public instruction of Ontario." Janes' Scientific Manual was published by the department of agriculture of the state of Georgia. Lupton's book was written under the auspices of the superintendent of public instruction and the commissioner of agriculture of the state of Tennessee. Gulley's "First Lessons" was written at the solicitation of the Agricultural College of Mississippi. Mills and Shaw's was "authorized by the honorable the minister of education for use in the public schools of Ontario." The plan of Voorhees' work was indorsed by the New Jersey State Board of Agriculture and the State Grange. Robins' edition of Dawson is published under the authority of the Protestant committee of the council of public instruction. James' book is written by the deputy minister of agriculture of Ontario. Two text-books of agriculture, one for pupils and one for teachers, have been "authorized by the advisory board of Manitoba" of the department of education; these books are "Our Canadian Prairies" and "Prairie Agriculture."

The outlook.

The most recent tendency in text-books of agriculture is an adaptation to the elementary country schools. A distinctly popular movement has set in to introduce agricultural teaching into the rural schools. This movement is necessarily experimental, and the experiment will be reflected in the text-books. Two types of books will come into use—the information-book, in which the subject-matter is to be learned and from which recitations are to be made, and the nature-study book, which will set pupils and teachers at work with actual things and affairs. The former mode will no doubt be more popular at the beginning, but the latter will have the more abiding influence, because it rests on sound pedagogical principles. In the lower grades, general nature-study will no doubt prove to be the most useful method of presentation, for this is fundamental. As the grades advance, nature-study agriculture can gradually be introduced.

It is probable that the most useful book, at least for the present, will be one that attempts at the same time to awaken an interest in country life and to set the pupil at the working out of specific problems. Mere problems are too "dry" to attract pupils, except now and then under the inspiration of an extra-good teacher. On the other hand, mere information-giving has little teaching value and is not likely to arouse any important enthusiasm for the open country and the farm. On account of the diversity of interests to be served, no single text-book of agriculture can hope to have great leadership in all parts of the country. The thoroughly satisfactory text is apparently yet to be written.

It will be seen that the foregoing discussion relates to agriculture in the elementary and secondary schools. Practically all of the texts are for elementary work. There will be no texts on "agriculture" for colleges, but texts on specific subjects, as on soils, fruits, milk, fertilizers, and the like; and even these will be used largely as reference books. This type of book is now beginning to appear, but it is not intended to discuss it here. Many of the simpler college manuals and laboratory guides on special subjects are adaptable to high schools. The briefer laboratory manuals are particularly adaptable, as Craig's "Judging of Live-stock," Lyon and Montgomery's "Grading Grains," Stevenson's "Soil Physics," Shamel's "Judging Corn."

Most of the recent school texts have been written by men in the colleges or by those not actually engaged in elementary and secondary education. We may expect the most adaptable books from well-trained agricultural college men and women who go into public school and secondary work.

CHRONOLOGICAL BIBLIOGRAPHY OF NORTH AMERICAN TEXT-BOOKS OF AGRICULTURE KNOWN TO THE EDITOR, UP TO AND INCLUDING THE YEAR 1900.

In the original publication of this chronology (Report Office of Experiment Station, 1903) the full tables of contents are given of such books as were there listed:

1824. DANIEL ADAMS, M.D. *The Agricultural Reader, Designed for the Use of Schools.* Boston, 1824. Published by Richardson & Lord. 264 pages.

The book is not divided into chapters. It contains about seventy articles, mostly on agricultural practice. There are a few poems; also a glossary. The book opens with an "explanation of terms," and it is designed that the greater part of these explanations be committed to memory.

1837. J. ORVILLE TAYLOR. *The Farmer's School Book.* Published at the "Common School Depository," Albany; and by Mack, Andrus & Woodruff, Ithaca. 232 pages.

1839. JOHN ARMSTRONG. *A Treatise on Agriculture: Comprising a Concise History of its Origin and Progress; the Present Condition of the Art Abroad and at Home, and the Theory and Practice of Husbandry. To which is added a Dissertation on the Kitchen and Fruit Garden.* With Notes by J. Buel. Harper & Bros. 282 pages. No. 88 of "School District Library."

1842. ALONZO GRAY, A.M., Teacher of Chemistry and Natural History in Philips Academy, Andover, Mass. *Elements of Scientific and Practical Agriculture, or the Application of Biology, Geology, and Chemistry to Agriculture and Horticulture. Intended as a Text-Book for Farmers and Students in Agriculture.* Allen, Morrill and Wardwell, Andover; Dayton and Newman, New York. 1812. 368 pages. Later published by Van Nostrand & Terrett, New York.

1845. *The Canadian Agricultural Reader, Designed Principally for the Use of Schools.* Compiled from the most approved and practical authors, by a vice-president of the Niagara District Agricultural Society and township superintendent of common schools. Published for the proprietors, Niagara. 304 pages.

The book contains eight chapters, none of which has a general heading or title. Each chapter is divided into many sections. The general subjects of the chapters are as follows: I, Hints for the different months; II, the plow and plowing; III, culture of wheat, barley, oats, pease, potatoes, Indian corn, broom-corn, roots, hemp, grasses, seeds; IV, horses, cattle; V, sheep, swine, poultry, plaster, marl, green crops; VI, capital, labor, implements and machines, examples of good and poor farmers; VII, chemistry, manure; VIII, rotation, drainage, lime, qualities of soils, laying down to grass.

1848. N. S. DAVIS, M.D. *A Text-Book on Agriculture.* Samuel S. & William Wood, New York. 187 pages. Illustrated with pictures of chemical apparatus and of insects.

1848. M. M. RODGERS, M.D. *Scientific Agriculture, or the Elements of Chemistry, Geology, Botany, and Meteorology, Applied to Practical Agriculture.* Illustrated by Numerous Engravings and a Copious Glossary. Erastus Darrow, Rochester. 279 pages.

A second edition was published in 1850, of 296 pages, by Erastus Darrow, Rochester; C. M. Saxton, New York; J. P. Jewett & Co., Boston. It is said that over 3,000 copies of this second edition were sold; and the plates were still in existence in 1899.

1848. L. BENTZ, Director of the Normal Primary School of the Meurthe, France, and A. J. CHRÉTIEN, of Roville, Professor of Rural Economy in the same school. *Elements of Agriculture, for the Use of Primary and Secondary Schools.* Translated and adapted to the use of rural primary schools of the United States of America by F. G. Skinner. C. M. Saxton & Co., New York. Copyright 1848. 91 pages.

1850. JOHN P. NORTON, M.A., Professor of Scientific Agriculture in Yale College. *Elements of Scientific Agriculture, or the Connection Between Science and the Art of Practical Farming.* Prize Essay of the New York State Agricultural Society. Adapted to the use of Schools. A. O. Moore, New York. Copyright 1850. 208 pages.

Norton's book went to a second edition in 1851 and to a fifth in 1854, and to the tenth thousand in 1855; published in different places and by different publishers.

1850. HENRY YOULE HIND, Mathematical Master and Lecturer in Chemistry and Natural Philosophy, at the Provincial Normal School. *Lectures on Agricultural Chemistry,* or *the Elements of the Science of Agriculture.* The above is the title of the second edition, 1851, which is the only edition known to the Editor. Brewer, McPhail & Co., Toronto. v + 168 pages.

1851. REV. JOHN L. BLAKE, D.D. *Lessons in Modern Farming, or Agriculture for Schools. Containing Scientific Exercises for Recitation and Elegant Extracts from Rural Literature for Academic or Family Reading.* Mark H. Newman & Co., New York. 432 pages. The cover stamp is "Agriculture for Schools."

It has no table of contents. The first essays are Moral Dignity of American Labor, The Harbinger of Spring, the Old Grist-mill (poem), Thanksgiving Day (poem), Scientific Terms in Agriculture, Agricultural Chemistry, The Crop of Acorns (poem), The American Ploughman, Physiological Reflections on Water, The Superiority of Educated Labor.

1854. J. A. NASH, Principal of Mount Pleasant Institute, Instructor of Agriculture in Amherst College, and Member of the Massachusetts Board of Agriculture. *The Progressive Farmer: A Scientific Treatise on Agricultural Chemistry and the Geology of Agriculture. On Plants, Animals, Manures, and Soils. Applied to Practical Agri-*

culture. Copyright, 1852. Reprinted in 1857 by A. O. Moore, New York. 254 pages.

The Amherst College Catalogue for 1852–3 says, "The elements of agriculture will be taught theoretically and practically by the Rev. J. A. Nash. Books: Nash's Elements of Agriculture, Practical and Theoretical; Norton's Elements of Scientific Agriculture, Girardin and Du Breuil's Cours Elementaire d'Agriculture; Johnston's Lectures on Practical Agriculture; Allen's Domestic Animals." The same statement appears in each catalogue thereafter to 1856–7 inclusive. Mr. Nash graduated at Amherst in 1824, and an extended notice of him appears in the Biographical Record of Amherst College, edited by W. L. Montague (1883). The only book ascribed to him in this notice is "The Progressive Farmer." It seems nearly certain that the "Elements of Agriculture" was never published. Probably it was used in the class in manuscript; or the title may have been changed to "The Progressive Farmer."

1854. George E. Waring, Jr., Consulting Agriculturist. *The Elements of Agriculture: A Book for Young Farmers. With Questions Prepared for the Use of Schools.* Clark & Maynard, New York. Copyright 1854. 288 pages.

For second edition, see entry under 1868.

1854. Charles Fox, Lecturer on Agriculture in the University of Michigan. *The American Text-Book of Practical and Scientific Agriculture, Intended for the Use of Colleges, Schools, and Private Students, as well as for the Practical Farmer. Including Analyses by the Most Eminent Chemists.* Elwood & Co., Detroit. 354 pages.

1859. J. L. Campbell, A.M., Professor of Physical Science, Washington College, Va. *A Manual of Scientific and Practical Agriculture, for the School and the Farm. With Numerous Illustrations.* Lindsay & Blakiston, Philadelphia. 442 pages.

1861. James F. W. Johnston, M.A., etc. *Catechism of Agricultural Chemistry and Geology.* Approved by the Provincial Board of Education for Use in the Schools of New Brunswick. Fortieth Edition. Barnes & Co., St. John, N. B. 68 pages.

An English work reprinted. Contains 406 questions with answers.

1862. George B. Emerson and Charles L. Flint, the latter Secretary of the Massachusetts State Board of Agriculture. *Manual of Agriculture, for the School, the Farm, and the Fireside.* Swan, Brewer & Tileston, Boston. 306 pages.

For second edition, see entry under 1885.

1864. J. W. Dawson, Principal of McGill University. *First Lessons in Scientific Agriculture. For Schools and Private Instruction.* John Lovell, Montreal, and Adam Miller, Toronto. viii+208 pages. (See under 1897.)

1868. George E. Waring, Jr. *The Elements of Agriculture: A Book for Young Farmers.* Second and revised edition. Orange Judd Co., New York. Copyright 1868. 254 pages. See entry under 1854.

1870. Egerton Ryerson. *First Lessons on Agriculture; for Canadian Farmers and Their Families.* Copp, Clark & Co., Toronto. Copyright 1870. xi + 216 pages.

A second edition of Ryerson appeared in 1871 as one of the "Canadian Series of School Books." There is no change except in the numbering of the chapters.

1875. E. M. Pendleton, M.D., Professor of Agriculture and Horticulture in the University of Georgia. *Text-book of Scientific Agriculture with Practical Deductions. Intended for the Use of Colleges, Schools, and Private Students.* A. S. Barnes & Co., New York. Copyright 1874. 419 pages.

Second edition, 1877, 443 pages, being enlarged by an addendum "embracing recent discoveries in agricultural science."

1878. Thomas P. Janes, Commissioner of Agriculture of the State of Georgia. *The Farmer's Scientific Manual.* Department of Agriculture, Atlanta, Ga. 168 pages.

1880. N. T. Lupton, LL.D., Professor of Chemistry in Vanderbilt University, Nashville, Tenn. *The Elementary Principles of Scientific Agriculture.* American Book Company. 107 pages.

1882. Henry Tanner. *First Principles of Agriculture.* Canada Publishing Co., Toronto. Second edition. 95 pages. (Canadian edition of a British book, with Canadian preface by Prof. William Brown. The first London edition was 1878; the second 1879.)

The Canadian copyright is 1880, as if the first American edition bore that date. The cover of this second edition is stamped "by Lawson and Tanner," but the publishers state (in a letter) that they do not know why the name of Lawson should be connected with the book. The book did not go to a subsequent edition in North America.

1882. R. S. Thompson. *Science in Farming. A Text-Book on the Principles of Agriculture, Including a Treatise on Agricultural Chemistry. Designed for Use in Schools, Granges, Farmers' Clubs, and by Farmers and Their Families.* Published by the Farmers' Advance, Springfield, O. 186 pages.

1883. Allen Bowie Davis, late President of the Board of Trustees of the Maryland Agricultural College. *Elementary Agriculture. For the Use of Schools.* John B. Piet & Co., Baltimore. vi + 126 pages.

1885. Emerson and Flint. *Manual of Agriculture.* A new edition, revised by Dr. Charles A. Goessmann, Professor of Chemistry, Massachusetts Agricultural College. Orange Judd Co., New York. Copyright 1885. 284 pages.

Has the same chapters as the first edition (1862), but the questions are omitted from the end of the volume.

1887. F. A. Gulley, Professor of Agriculture in Agricultural College of Mississippi, Starkville, Miss. *First Lessons in Agriculture.* Published by the Author. 118 pages.

A second edition, revised and enlarged, appeared in 1892, by the Rural Publishing Company, New York. 155

pages. Illustrated. The following chapters are added: Farm Live Stock; Breeds of Horses; Breeds of Cattle; Sheep.

1888. MASON C. WELD and other writers. *The A B C of Agriculture.* Orange Judd Co., New York. Copyright 1887. 66 pages.

Advertised as a book "adapted to district and rural schools," but there is no evidence in the book that it was written as a definite text-book.

1890. JAMES MILLS, M. A., President Ontario Agricultural College, and THOMAS SHAW, Professor of Agriculture, Ontario Agricultural College. *The First Principles of Agriculture.* Authorized by the honorable the minister of education for use in the public schools of Ontario. J. E. Bryant Co., Toronto. 250 pages.

1891. I. O. WINSLOW, A.M. *The Principles of Agriculture for Common Schools.* American Book Co. 152 pages.

1895. R. HEDGER WALLACE, late Lecturer and Examiner in Agriculture to the Education Department of Victoria and the Victorian Department of Agriculture. *Agriculture.* Illustrated. J. B. Lippincott Co. 352 pages.

"This book has been written with the object of placing before the student and reader a simple statement of the principles of agriculture."

1895. *Our Canadian Prairies. Being a Description of the Most Notable Plants of Manitoba; the Chief Noxious Weeds and How to Destroy Them; the Trees and Wild Fruits, along with Arbor-Day Exercises and Poems.* C. Blackett Robinson, Toronto. Copyright 1895. 162 pages. Manitoba Course of Agriculture, first series.

1895 (?). *Prairie Agriculture. Containing a List of Chemical Experiments; A Series of Experiments on the Growth of Seeds; A Description of How Plants Grow; A Sketch of the Formation of the Prairie Soil by Water and Ice Action; An Account of Farming Operations and of Crops Adapted to Manitoba; A Description of Diseases of Crops, of Insects, and of Birds; An Account with Illustrations of the Breeds of Horses, Cattle, Sheep, Swine, and Poultry Adapted to Manitoba; Advantages of Mixed Farming.* The Consolidated Stationery Co., Winnipeg. 259 pages. Manitoba Course of Agriculture, second series.

Forty colored plates of the plants of Manitoba accompany these two books.

1896. EDWARD B. VOORHEES, A. M., Director of the New Jersey Agricultural Experiment Stations and Professor of Agriculture in Rutgers College. *First Principles of Agriculture.* Silver, Burdett & Co., Boston. 212 pages.

1897. SIR WILLIAM DAWSON, late Principal of McGill University. *First Lessons in the Scientific Principles of Agriculture. For Schools and Private Instruction.* New edition, revised and enlarged, with the permission of the author, by S. P. Robins, Principal of the McGill Normal School. W. Drysdale & Co., Montreal. Copyright 1897. 323 pages. (See under 1864.)

1898. CHARLES C. JAMES, Deputy Minister of Agriculture for Ontario, formerly Professor of Chemistry at the Ontario Agricultural College. *Agriculture.* George N. Morang, Toronto. 200 pages.

"American edition," 1899, edited by John Craig, Professor of Horticulture in the Iowa Agricultural College. 203 pages. Preserves the original chapters and text, but uses various new cuts and inserts full-page half-tones, and adds three pages on adornment of school grounds.

1898. L. H. BAILEY, Professor of Horticulture in the Cornell University. *The Principles of Agriculture: A Text-book for Schools and Rural Societies.* The Macmillan Co., New York. 300 pages.

Second edition, January, 1900; third, January, 1901; thirteenth, 1908.

1900. ROMULO ESCOBAR, Editor of El Agricultor Mexicano. *Tratado elemental de Agricultura, por el ingeniero agrónomo.* C. Juarez, Chihuahua, Mexico. 207 pages.

Since 1900, the following school texts (and probably others) have been put on the market: J. B. McBryde, *Elements of Agriculture, for Use in Schools,* B. F. Johnson Pub. Co., Richmond, Va.; W. P. Brooks, *Agriculture,* King-Richardson Co., Springfield, Mass.; Francis Watts, *Nature Teaching, Based upon the General Principles of Agriculture, for the Use of Schools,* Bowen & Sons, Bridgetown, Barbadoes; F. P. Sever, *Elements of Agriculture, with Industrial Lessons,* D. C. Heath & Co.; C. E. Bessey, Lawrence Bruner, G. D. Swezey, *New Elementary Agriculture for Rural and Graded Schools,* Univ. Pub. Co., Lincoln, Neb.; C. W. Burkett, F. L. Stevens, D. H. Hill, *Agriculture for Beginners,* Ginn & Co.; University of Minnesota, W. M. Hays, editor, *Exercises in Agriculture and Housekeeping for Rural Schools,* McGill-Warner Co., St. Paul; J. B. Hunnicutt, *Agriculture for the Common Schools,* Cultivator Pub. Co., Atlanta; E. S. Goff and D. D. Mayne, *First Principles of Agriculture,* American Book Co.; C. R. Jackson and L. S. Daugherty, *Agriculture, through the Laboratory and School Garden,* Orange Judd Co.; Chas. L. Goodrich, *The First Book of Farming,* Doubleday, Page & Co.; J. H. Shepperd and J. C. McDowell, *Elements of Agriculture,* Webb Pub. Co., St. Paul; J. A. Haselwood and K. L. Hatch, *Primary Agriculture and Practical Arithmetic,* Waterloo (Wis.) Democrat Print; K. L. Hatch and J. A. Haselwood, *Elementary Agriculture with Practical Arithmetic,* B. K. Row & Co., Chicago; H. B. M. Buchanan and A. V. Stubenrauch, *A Country Reader,* The Macmillan Co.; Charles W. Davis, *Rural School Agriculture,* Orange Judd Co.; A. M. Soule and Edna H. L. Turpin, *Agriculture, Its Fundamental Principles,* B. F. Johnson Pub. Co, Richmond, Va.; J. F. Duggar, *Agriculture for Southern Schools,* The Macmillan Co.; W. C. Welborn, *Elements of Agriculture, Southern and Western,* The Macmillan Co.; A. M. Ferguson and L. L. Lewis, *Elementary Principles of Agriculture,* Ferguson Pub. Co., Sherman, Texas.

A number of the agricultural colleges and the United States Department of Agriculture publish bulletins and leaflets specially designed for the schools.

THE RISE OF THE STATE COLLEGES OF AGRICULTURE

The preceding history indicates that the desire for education in terms of agriculture had become wide-spread long before the middle of last century. The difficulty of founding and maintaining effective institutions naturally led to a demand for state and federal aid. The subject was widely discussed in societies, so much so that we may well say that from agricultural societies have come the foundation of the state agricultural colleges. It is in these organizations that the ideas crystallize; and they finally make their demands upon the legislatures. This only means that associated effort is necessary to the accomplishment of any great work. At first it was proposed that the societies themselves, or stock companies of interested parties, should support the schools; but the idea of government support gradually grew and finally controlled.

The movements begin, of course, with individuals here and there who look into the future and who insist on the soundness of their views. It will be impossible, in this brief history, to mention all the persons who were prominent in the gradually accumulating movement to found a governmental system of agricultural and technical schools, but some of the striking points in the evolution may be mentioned. The final founding of these colleges is an event of such unusual importance to the American nation and to the world that its full record should some time be collected and a connected history written.

The course of the early movements in New York, Pennsylvania, Michigan, Connecticut and Maryland well illustrates the gradual growth of the ideas. In New York, the course of evolution passed through support by stock companies; in Pennsylvania, through direct support by agricultural societies; in Michigan, from support wholly by the state; in Maryland, out of joint support by farmers and the state; in Connecticut, out of work arising in a long-established institution.

The eventual conceptions everywhere are chiefly three: (1) To be educated or trained is the right of every person; (2) this education should have relation to the life and necessities of the person; (3) it is the duty of society (or the government) to establish and maintain this education.

We have already traced some of the beginnings of agricultural education. These beginnings cannot be dissociated from the records that now follow, for all beginnings indicate the state of the public mind at any epoch and also contribute to the making of public sentiment; yet in the present article we may properly consider by themselves those movements that seem to have had direct relation to the idea of state or national support or that emerged from institutions that later became the recipients of the Congressional Land-Grant funds. The movements recorded in this chapter are those that eventuated directly into the great state colleges and universities or the technical and agricultural departments of them.

I. Outline of the History in New York

It would be difficult to determine when the first movement for instruction in agriculture began in New York. The subject must have been much discussed at the opening of the nineteenth century. The agitation for a state college was persistent from 1830 to 1862, and it recurred just at the close of the century. All manner of schemes were propounded. County schools of agriculture were early advised. The contest seems to have been particularly intense and long-continued in New York. Some of the salient points in the history will illustrate the movement.

Any full study of the subject would probably trace the movements back at least as far as the organization of the New York Society for the Promotion of Agriculture, February 26, 1791. In New York, as elsewhere, the agitation for agricultural education went along with the general movement for educational reform. The early years of last century were years of new theories in education, following the teaching of Pestalozzi, Frœbel, Bell and Lancaster, and others. In 1821, the legislature authorized the establishment of Lancastrian schools,—a type of educational method known as the monitorial system, the older pupils instructing the younger. The old private academies were being challenged and new ideas were prevalent.

DeWitt Clinton and the Board of Agriculture.

In his speech to the legislature on January 27, 1818, Governor DeWitt Clinton gave first attention to the agricultural interests of the state. He advised the organization of a board which should have charge of these interests, and suggested that a professorship of agriculture be connected with the board or with the University of the State of New York (which is an examining and supervisory institution exercising control over educational affairs in the state). In subsequent speeches to the legislature, Governor Clinton also dwelt on the importance of aiding agriculture in an educational way, chiefly through the Board of Agriculture and societies. The phraseology of his recommendation of 1818 is as follows:

"If not the exclusive duty, it is certainly the peculiar province of the state governments to superintend and advance the interests of agriculture. To this end, it is advisable to constitute a board, composed of the most experienced and best-informed agriculturists and to render it their duty to diffuse agricultural knowledge; to correspond with the country societies; to communicate to them beneficial discoveries and improvements; to introduce useful seeds, plants, trees and animals, implements of husbandry, and labor-saving machines; to explore the minerals of the country, and to publish periodically the most valuable observations and treatises on husbandry, horticulture and rural economy. The county societies ought to be enabled to distribute adequate premiums; and a professorship of agriculture connected with the board or attached to the university, might also be constituted, embracing the kindred sciences of

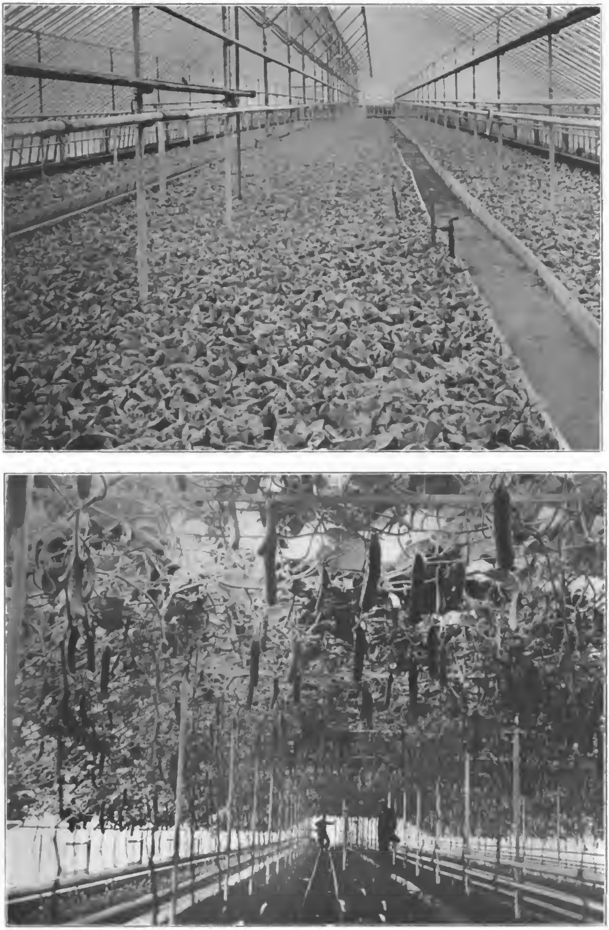


Plate XVII. Farming under glass. Lettuce above; cucumbers beneath. New Jersey

chemistry and geology, mineralogy, botany and the other departments of natural history. By which means a complete course of agricultural education would be taught, developing the principles of the science, illustrating the practice of the art, and restoring this first and best pursuit of man to that intellectual rank which it ought to occupy in the scale of human estimation."

On the 7th of April, 1819, an act was passed "to improve the agriculture of this state," and $10,000 was appropriated for the purpose, to be distributed among the several counties by means of a society, the state to contribute, within limits, an amount equal to what the society would raise by voluntary subscription. These several agricultural societies were empowered to elect officers among practical farmers whose duty it should be "annually to regulate and award premiums on such articles and productions as they may deem best calculated to promote the agricultural and manufacturing interests of this state." It was further provided that each person receiving a premium for any agricultural product should, before receiving the amount of the premium, make a full description of the methods that he had employed in producing it and deliver this description to the president of his society. The presidents of the several agricultural societies, or delegates chosen by such societies, constituted a Board of Agriculture who should meet annually at Albany, and there receive and examine all such reports and returns from the various societies and choose such as were deemed worthy of publication. The Board was to publish a volume "to be distributed, by means of said agricultural societies, to the good people of the state, not exceeding 1,500 copies of such volume." This organization went into effect and continued until 1826, when it expired by limitation. There is nothing in the law, however, requiring a professorship of agriculture, nor any mention of schools, but the whole reason for the establishment of the Board was to educate the people to a better agriculture.

The successor to this original Board of Agriculture was the New York State Agricultural Society, organized as the result of an "Agricultural State Convention," held at Albany in February, 1832. This society was chartered by the state, but for some years had a precarious existence. The method of distributing state funds to the counties through their societies, was maintained in this new organization. This relationship to the agricultural societies still exists in New York, but the societies, which are now fair associations, have only fiscal relations with state organization, reporting to the State Department of Agriculture. The New York State Agricultural Society still exists in name, but its functions have been absorbed by other movements and organizations, and the only influence that it now exerts is through its President being a member, ex-officio, of the Board of Trustees of Cornell University. Although the teaching of agriculture by means of a professorship, as originally propounded by Governor Clinton, never became a part of the work of the Board of Agriculture and its successor, it is, nevertheless, interesting to know that its one remaining function is connected with higher agricultural education.

Simeon DeWitt.

In 1819, an anonymous pamphlet of forty-two pages was published in Albany on "Considerations on the necessity of establishing an agricultural college, and having more of the children of wealthy citizens educated for the profession of farming." This pamphlet was written by Simeon DeWitt, founder of Ithaca, N. Y., where he died in 1834. DeWitt was Surveyor-General of the state from 1784 to 1835, a man of many scientific attainments, and influential in many state and federal affairs. General James Clinton, first governor of the state after the Revolution, was his uncle; and DeWitt Clinton, a later governor and promotor of the Erie Canal, was his cousin. It may be assumed that Simeon DeWitt and DeWitt Clinton caucused their opinions on agricultural education, although the plans of the two are not alike.

It will be seen by the title of the essay, that DeWitt did not have the farmer chiefly in mind. His illustrations are drawn largely from classical and historical sources. His style is ponderous and dignified. All this reflects the habit of thought of the time; it is well to apprehend this point of view, and therefore liberal extracts are made from DeWitt's paper. In the way of concrete suggestions, his proposal that such an institution as he has in mind would best be known as The Agricultural College of the State of New York is most interesting.

"There are now thousands of wealthy citizens in this state," he writes, "who do not know what to do with their sons. In the first place, without any determinate object in view, they give them a liberal education, or rather, they send them for four years to a college to obtain the reputation of having a graduate's diploma, and so much instruction in the dead languages and the ordinary sciences as they are compelled or disposed to attend to; after that there are only three professions from which ordinarily they are to choose their means of living and rising into consequence—law, physic and divinity; but so great are the numbers of young gentlemen destined for those professions, that their prospects are truly dismal; but what other provision can their fathers make for them? Turn them to some mechanic employment? that is considered too degrading. To manufacturing? it has been tried and proved ruinous. To mercantile business? that too is overstocked. To the army or navy? there is little room there, and many reasons against it. To farming? nothing, it is said, can be made by it."

"A number of considerations not capable of enumeration, besides those already anticipated, crowd on the reflecting mind in favor of an institution, especially in our country, that shall have for its primary object instruction in theoretic and practical agriculture. But it may be asked, on the introduction of the subject, why have not institutions of this kind been formed and patronized in older countries, especially in England, where agriculture has so much engaged the attention of its first characters, and where it has been carried to such a height of perfection? The reason is obvious. In most foreign countries the fee of the soil is generally in the gentry, who besides their tenantries, have extensive farms under their immediate superintendence; who make farming in some measure a business, and who can afford to make experiments and communicate such as result in improvements of consequence, to those, who, pursuing a steady course, known to be safe and profitable, will not hazard a departure from it without such a demonstration. Such improvements are moreover communicated to their societies or boards of agriculture, by which they are published for the benefit of the public, and thus constantly reciprocated among all who are engaged in its interests. The sons of such gentlemen farmers, from the practice of which they are the constant witnesses, can hardly fail of acquiring a proficiency in the knowledge of agriculture, so far at least as to qualify them for its superintendence. Thus, then, every landlord's farm becomes, to a certain degree, a school of practical agriculture, where experiments are constantly made, by wealthy, scientific, and practical men, to ascertain the best methods of profitable culture; where the knowledge of it is transmitted as a family inheritance, and sheds its meliorating influence, immediately over a wide circle of tenantry, and remotely over the kingdom at large. And even in those countries there are not wanting some arrangements in their academical establishments for teaching the scientific parts, if not the actual practice of agriculture. But here circumstances are widely different. With but very few exceptions, we have no landlords, and fewer still of that class who turn their attention to farming. It is the glory of our country, that with such rare exceptions, every farmer is the absolute, independent lord of his own territory, little as it may be, and works it with his own hands, and by his own hired laborers. His children are his pupils, whom he teaches from their infancy the mysteries of his calling; but the mediocrity of his circumstances, and his habitual prudence will not permit him to hazard experiments for improvements. What he knows of it, as practised by his father, will be known by his children, and they will probably, during their lives, follow his track without deviation. Under such circumstances, agriculture must remain at a stand, although, like other arts, its past progressive improvements warrant the presumption that to its future no limits can be assigned."

"The inference from all these facts and observations then is, that there is and must remain an insurmountable barrier to prevent the sons of men of other professions, and especially of the rich, from becoming farmers, unless there be some institution in which they can receive an education for that profession in a manner different from what is now possible: That it would be incalculably for the benefit of our country if the surplus candidates for other professions could be diverted to this, the most useful of all: – And, therefore, that an institution specially intended for this purpose is of the greatest importance;—that it is demanded by every consideration of the wisest policy, and that the resources of government cannot be better employed for any other object for which governments are formed.

"It may be called an agricultural school, academy or college, no matter which; but if any importance is to be attached to names, I would give it the most respectable, and call it the Agricultural College of the State of New-York.

"Its primary object should be to teach the theory and practice of agriculture, with such branches of other sciences as may be serviceable to them: its secondary, to make improvements."

Van Rensselaer.

One of the very early foundations for technical instruction was the founding of the Rensselaer Polytechnic Institute at Troy. This was founded by Hon. Stephen Van Rensselaer, of Albany, in 1824. Mr. Van Rensselaer was chairman of the Board of Agriculture (page 386), established on the recommendation of Governor Clinton. He was deeply interested in agriculture and all other industrial pursuits. The institution was incorporated by the legislature, March 21, 1826. It was designed to be a school of practical science. Van Rensselaer outlined his purpose as follows: "I have established a school at the north end of Troy for the purpose of instructing persons who may choose to apply themselves in the application of science to the common purposes of life. My principal object is to qualify teachers for instructing sons and daughters of farmers and mechanics, by lectures or otherwise, on the application of experimental chemistry, philosophy, and natural history to agriculture, domestic economy, the arts and manufactures."

In the first circular of the school the farmer as well as the mechanic, clergyman, lawyer, physician and merchant was mentioned as being within the purview of the school. Amos Eaton was called to the institution. He was one of the pioneers in science teaching in this country. He was the author of a Botany of the United States. No definite or separate agricultural instruction seems ever to have been given in the Institute, however.

James Tallmadge.

Many persons early took up the advocacy of industrial education. Among others was James Tallmadge, lieutenant-governor, who, in 1826, as chairman of a committee appointed to inquire into the condition of the College of Physicians and Surgeons in New York city, urged that the sciences underlying agriculture and the mechanic arts should be taught to the masses. He proposed courses of lectures on these subjects in existing colleges and in academies.

The first charter.

At the first meeting of the State Agricultural Society (1832), a committee was appointed to report on a plan for an agricultural school. On February 14, 1833, it reported a plan with an estimate of the expense. The plan contemplated a farm, farmhouse and farm buildings, school building, library and philosophical apparatus, stock and implements for the farm, and shops. Assuming, "as reasonable data, that the number of pupils would average 200, and the average produce of the farm amount to $4,000 per annum, for the first four years," the following estimate was made:

PRELIMINARY EXPENSES

Farm of 400 acres, at $30	$12,000	
Farm buildings	6,000	
School buildings	25,000	
Library and apparatus	7,500	
Stock and implements	3,150	
Shops and tools	1,250	
Furniture for school	1,150	
Incidental	1,500	
Total preliminary expense		$57,550

ANNUAL EXPENSE

Salaries of officers and teachers of the school	$5,100	
Salaries of manager and laborers on farm	1,000	
Salaries of machinists	600	
Salary of gardener	300	
Expense of boarding 200 pupils, at $1.50 per week	14,400	
Servants for the establishment	2,000	
Estimated annual expense		$23,400
		$80,950

The Annual Receipts are computed as follows:

Board and tuition of 200 pupils, at $150 per annum	$30,000
Produce of farm	4,000
	$34,000

The demand for a state school for agriculture became crystallized into law on the 6th of May, 1836, when the legislature passed an act authorizing the establishment of such an institution. This act provided for a corporation to hold, own and manage the school. Sufficient subscribers, apparently, were not found, and the school never came into existence. The law is striking in many particulars, as evidencing the fact that schools were then regarded as business ventures rather than public institutions, in the very small attention it gives to defining the educational work of the institution and the very detailed mode of its business organization, the insistence on manual work, the prohibition of any initial subscription of more than one thousand dollars, the provision that the incorporators should not receive more than 5 per cent on their investment, and the annual election of trustees. It is clearly a democratic document, proceeding on the theory that the people should help themselves and that they should exercise control. As this is probably the first legislative enactment for the establishment of a state school or college of agriculture, the act may be given in full:

AN ACT to incorporate the New-York State Agricultural School.

Passed May 6, 1836.

The People of the State of New-York represented in Senate and Assembly, do enact as follows:

1. William L. Marcy, John Tracy, Jesse Buel, Stephen Van Rensselaer, Henry Yates, Gideon Lee, Joab Center, John P. Beekman, Cornelius W. Lawrence, Philip Hone, Benjamin Knower, Gouverneur Ogden, Erastus Corning, James Wadsworth, David E. Evans, Hiram Pratt, Walter Cunningham, Gilbert O. Fowler, Nathaniel P. Tallmadge, Nicholas Devereux, Anthony Van Bergen, Garrit Wendell, Archibald M'Intyre, Thomas D. Burrall, John Greig, Thomas W. Olcott, Ziba A. Leland, George P. Oakley, John Delafield, Edward P. Livingston, John Townsend, Lewis F. Allen, and all such persons as now are or may hereafter become associated with them, are hereby constituted a body corporate, by the name of "The New-York State Agricultural School," for the purposes of instruction in literature and science, and improvement in scientific and practical agriculture and the mechanic arts.

2. The capital stock of the said corporation shall be one hundred thousand dollars, with liberty to increase it to two hundred thousand dollars; to be divided into shares of twenty-five dollars each, which shall be considered as personal property, and be assignable in such manner as the said corporation may, in its by-laws, from time to time, provide: which said capital stock shall be exclusively devoted to the purposes and objects of the said corporation as declared in the first section of this act, and to no other purposes or objects whatever. And to the same end the said corporation shall have power to take, hold, and convey real estate to the extent of its said capital.

3. Jesse Buel, Lewis F. Allen, Henry Yates, John P. Beekman, Joab Center, Walter Cunningham and John Delafield, shall be commissioners to receive subscriptions for, and to distribute the said capital stock of the said corporation.

4. The said commissioners, or a majority of them, shall, within thirty days after the passage of this act, open a subscription book for the said stock, at such times and places as they shall appoint; and they shall give at least fourteen days' previous notice thereof in at least two of the agricultural papers in this state.

5. At the first subscription to the capital stock of the said corporation, no subscription above one thousand dollars, by or in behalf of the same individual, shall be received. Five per cent on each share subscribed for, shall be paid to the said commissioners at the time of making such subscription; forty-five per cent thereon when afterwards called for by them; and the remaining fifty per cent at the expiration of six months from the time of such subscription.

6. If the whole of the capital stock of the said corporation be not taken up at the first subscription thereto, the said commissioners, or a majority of them, may receive further subscriptions thereto, from time to time, until the whole capital stock of the said corporation shall be taken up.

7. The said commissioners, or a majority of them, shall, within twelve months after the passage of this act, proceed to distribute the capital stock of the said corporation among the subscribers thereto; and in case there should be subscriptions to more than the amount of such stock, it shall be the duty of such commissioners to apportion the same among the subscribers thereto, in such manner as they may deem most advantageous to the interests of the said institution, and best calculated to promote its objects.

8. The stock, property and concerns of the said corporation shall be managed by thirty-two trustees, of whom the governor and lieutenant-governor of the state,

for the time being, shall always, by virtue of their offices, be two; and the remaining thirty shall be stockholders of the said corporation, and citizens of this state. They shall be elected annually, and any seven thereof shall be a quorum for the transaction of the ordinary business of the said corporation.

9. The persons named in the first section of this act shall be the first trustees of the said corporation, and shall hold their offices until the first Tuesday of February, one thousand eight hundred and thirty-seven, and until others shall be elected in their places.

10. The trustees of the said corporation for every subsequent year, except the governor and lieutenant-governor, shall be elected on the first Tuesday of February in each and every year, at such hour of the day and at such place as the trustees for the time being shall appoint, and of which they shall give public notice not less than fourteen days previous to the time of holding such election, by advertisement to be inserted in at least two of the agricultural papers in this state.

11. At every election of trustees, each stockholder shall be entitled to one vote on each share of stock owned by him, and which he shall have held for at least fourteen days next preceding such election.

12. All elections for trustees, other than the governor and lieutenant-governor, shall be held under the inspection of three stockholders, not being trustees, to be appointed previous to every election by the board of trustees for the time being. Such election shall be by ballot, and by plurality of the votes of the stockholders or their proxies then present; and the thirty persons who shall receive the greatest number of votes shall, together with the governor and lieutenant-governor for the time being, be the trustees of the said corporation; and if at any such election for trustees, two or more persons shall have an equal number of votes, then the trustees who shall have been duly elected, shall proceed by ballot, and by plurality of votes, to determine which of the said persons, so having an equal number of votes, shall be trustee or trustees, so as to complete the whole number.

13. If any trustee of the said corporation, other than the governor or lieutenant-governor, shall cease to be a stockholder thereof, or shall remove out of the state, his office shall thereby become vacant; and whenever any vacancy shall happen among the trustees, such vacancy shall be filled for the remainder of the year in which it shall so happen, by such person possessing the qualifications above required for trustee of this corporation, as the remaining trustees for the time being, or a majority of them, shall appoint.

14. The trustees of said corporation, as soon as may be after their appointment or election under this act, shall, in like manner, proceed to elect, of their number, a president, two vice-presidents, a treasurer, recording secretary and corresponding secretary, who shall respectively hold their offices for one year, and until others are elected in their places. They shall also appoint such professors, teachers, agents, and other persons as may be necessary to conduct the proper business, and accomplish the declared objects of the said corporation.

15. The said trustees shall, as soon as may be, proceed to purchase a farm of about five hundred acres of land, either contiguous to, or near the Hudson river, and as nigh to the city of Albany as may be convenient; and shall cause to be erected thereon such buildings as may be suitable and necessary, and make all such other arrangements as may be proper for the future business of the said corporation, and for the accomplishment of its objects.

16. The said corporation in exercising its power of making by-laws for its own government, shall make it an indispensable requirement that the professors, teachers, and pupils of the school hereby intend to be authorized and established, shall, unless prevented by sickness or other reasonable cause, occupy themselves for at least one-half of the time the said school is in session, between the months of March and December, either in the practical agricultural business of the farm, or in the laboratories or mechanic shops connected with said school.

17. The said corporation shall in no case, out of the profits arising from its business, declare and make a dividend of more than five per cent per annum, upon its actual incorporated capital paid in and possessed; and if at any time, after the payment of such dividend, there shall remain any surplus of such profits, it shall be expended in additions or improvements to the farm, buildings, library, apparatus, or other necessary establishments connected with the said institution, or in reducing the price of tuition at the same.

18. The governor shall appoint annually a committee of three persons, whose duty it shall be to visit the said institution, and to report the condition thereof to the legislature at the commencement of its next session. The members of the said committee shall receive no compensation for their services under this act, but their reasonable expenses shall be paid by the said corporation.

19. The corporation hereby created shall be subject to the provisions of the eighteenth chapter of the first part the Revised Statutes, so far as the same are applicable, and have not been modified or repealed.

20. This act shall take effect immediately after the passage thereof.

Continuing agitation; John Delafield.

The State Agricultural Society continued to agitate the subject of a college of agriculture. It is said that in 1839 eighty petitions were sent to the legislature, and that not a year passed that the subject was not brought before the legislature in some form. The following extract from the transactions of the State Agricultural Society for 1849 indicates the persistency of the demands on the legislature: "Dr. Lee (pages 375, 378), of Georgia (formerly of Buffalo), said it was well known that he had taken a deep interest in the subject of an agricultural school. Attempts were made to establish such an institution, as early as 1822, and during the whole of that period, in which a generation has passed off the stage, the subject had received the closest attention of the friends of Agriculture, in the Empire State. The great difficulty has been that they were divided on the subject. Some desired one school, some three, and some eight, and some, one in every county, and in this way they had accomplished nothing. He would counsel them to be united, and they would be successful. A bill making an appropriation of $15,000 for this purpose, which he presented in the legislature, received 100 out of 108 votes in the lower house. In 1844, the next year, it again passed the house, but was lost in the senate, by one vote; it receiving 21, and 22 votes being necessary for the appropriation. Now, agreeably to the recommendation of Governor Fish, the legislature had appointed a committee of eight, one from each judicial district, who after a careful investigation for months, had come to a general conclusion, and were prepared to report, through the governor, to the legislature, on the subject. They recommended, and as he thought, wisely, the establishment of a single school and farm, to test the experiment. If it was to be a successful one, the legislature would establish as many more, as farmers should demand. As regarded a single professor, they might as well have a single professor in a medical college, and require him to teach all the branches of the healing art, as to expect one man to teach every branch of agriculture. At least six professors were required. These were the views he had adopted, after years of reflection and careful investigation." A "New York State School of Agriculture" was chartered by the legislature in 1844.

In 1849, a college was advocated by Governor Hamilton Fish. In this year, by direction of the legislature, the Governor of the state appointed a board of eight commissioners, one from each judicial district, which was directed to meet at Albany and mature plans for an agricultural college and experimental farm. The report was to be laid before the legislature at its next session. The following persons were members of the commission:

Joseph Blunt, New York, First District; A. J. Downing, Orange, Second District; John P. Beekman, Columbia, Third District; Samuel Cheever, Saratoga, Fourth District; Edward Kirby, Jefferson, Fifth District; Adrian Lott, Chenango, Sixth District; J. S. Wadsworth, Livingston, Seventh District; William Risley, Chautauqua, Eighth District.

The report of this commission was presented to the legislature in 1850. Various projects were presented to the legislature, and in 1851 a bill to establish a college was again lost by a single vote.

A charter was granted, however, on April 15, 1853, for the "New York State Agricultural College." The full act is as follows:

> The people of the State of New York, represented in Senate and Assembly, do enact as follows:
>
> 1. John Delafield, Henry Wager, B. P. Johnson, William Kelly, John A. King, N. B. Kidder, Joel W. Bacon, William Buel, Tallmadge Delafield, Robert J. Swan, and such other persons as shall or may be associated with them for that purpose, are hereby constituted and created a body politic and corporate by the name, style and description of the 'New-York State Agricultural College,' and the said corporation shall have and enjoy all the corporate rights and privileges enjoyed by an incorporated college in the State of New York, and shall be subject to the provisions and exercise the powers and duties contained and set forth in the second article of the fifteenth chapter, title one, of the revised statutes.
>
> 2. The farm and grounds belonging and attached to the said college shall consist of not less than three hundred acres.
>
> 3. The plan of instruction shall embrace the following branches of knowledge: practical and scientific agriculture, chemistry and its manipulations so far as it may be usefully connected with agriculture, mathematics and mechanics, surveying and engineering, geology and botany, the practical management of the farm, of the dairy, and of the various kinds of live stock; also such other branches of knowledge as may be deemed useful and proper.
>
> 4. The persons named in the first section of this act shall be and form the first board of trustees.
>
> 5. This act shall take effect immediately.

By the following statement in the Journal of the New York State Agricultural Society, July 1853, it will be seen that under this charter a college was organized and a farm purchased:

"This institution [New York State Agricultural College] was chartered by the Legislature of the State of New York, for the purpose of presenting to Agriculture the means for acquiring a knowledge of the Arts and Sciences appropriate to their vocation; to prepare Students for practical active labor, by training the mind in a system which shall inculcate an intimate acquaintance with the sciences essential to agricultural success.

"To insure the development of principles and their application to the soil, the Legislature has required the purchase of not less than three hundred acres of land.

"The Trustees, having accepted the trust confided to them by the Legislature, organized the State Agricultural College, by the following appointments: John Delafield, President of the College; Hon. John A. King, Chairman of the Board of Trustees; Joel W. Bacon, Secretary; N. B. Kidder, Treasurer.

"At a meeting of the Board on June 4, a Report was presented by B. P. Johnson [Corresponding Secretary of the State Agricultural Society], from a special committee, on the location of the college, declaring 'that after an examination of the Oaklands Farm [Fayette township] in Seneca county, they are entirely satisfied that the price asked for it is its fair value in the market for farming purposes; that it is, by previous preparation, by position and variety of soil, in every respect adapted to the objects of the Institution; that the title is perfect; and recommend that the chain of title be entered at large on the minutes of the Board,' etc. This farm is situated midway between the market towns of Waterloo and Geneva, in full view of Seneca Lake, and overlooking the village of Geneva; elevated about one hundred and twenty-five feet above the lake, it is free from causes disturbing health; its soil varies from a strong clay to a sandy loam, presenting varieties sufficient for testing by experiment every doubtful question in relation to soils, and to exhibit the most improved system of cultivation.

"The Trustees are prepared to receive from Farmers and friends of Agriculture proposals for the capital stock of the Institution, which will be distributed in shares of fifty dollars each, payable, 10 per cent on subscribing; 40 per cent on the first of July; 50 per cent on the first of October.

"The trustees may be addressed (postpaid) at their respective residences, as follows:

"Hon. John A. King, Jamacia, Queens county; Henry Wager, Westernville, Oneida county; B. P. Johnson, Agricultural Rooms, Albany; Wm. Kelly, Rhinebeck, Dutchess county; N. B. Kidder, Geneva, Ontario county; Joel W. Bacon, Waterloo, Seneca county; Tallmadge Delafield, Geneva, Ontario county; Wm. Buel, Rochester, Monroe county; John Delafield, Oaklands, Seneca county.

"The officers of the College will endeavor to present subscription books in each county, that the College, so entirely Agricultural and peculiarly the Farmers' Institution, may find its support widely diffused throughout the State.

"The President will, upon application to him, give all needful information as to the ordinances, rules and regulations of the College, and the courses of instruction to be pursued."

Owing to the death of John Delafield, on the 22d of October, 1853, this project came to an end.

The reader will observe that John Delafield was one of the incorporators of the first school (page 389), but that none of the others are the same. He will observe, also, that the two laws are similar in theory, but with less machinery and more definition of education. It is probable that Delafield was a moving spirit in both enterprises; it is said that the charter of 1853 was secured from the legislature through his efforts.

John Delafield was born in New York City in 1786; graduated from Columbia in 1802; engaged with his father in mercantile pursuits; was shipwrecked on the coast of Spain; went to London and became a banker; returned to America in 1820; president of Phœnix Banking Company till 1838, and then president of the New York Banking Company; instrumental in founding the University of New York and reviving the New York Historical Society, and in support of musical organizations; went to farming in 1842, and his farm became noted; wrote an agricultural survey of Seneca county [Transactions New York Agricultural Society, 1850] that may serve as a text at the present day. In 1847, he was elected president of the Seneca County Agricultural Society; and in 1851, president of the New York State Agricultural Society, which was then the highest agricultural honor in the state. He died at the age of sixty-seven. His death, at the moment of the realization of his hopes and work, is one of the most pathetic events in the history of agricultural education.

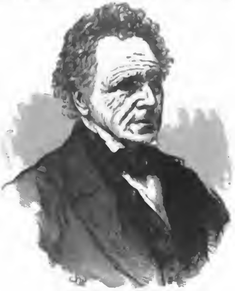


Fig. 108. John Delafield.

Speaking before the Seneca County Agricultural Society, at the time of his death, Joel W. Bacon, his associate, said that, in the face of continued neglect on the part of the state in the college project, Delafield "resolved to carry through this important enterprise by personal effort, and to secure, if possible, the location of so important an institution in our own county. The incipient steps had all been taken; he had well-nigh surmounted the many obstacles in the way of the attainment of his exalted purpose, when the hand of death arrested forever his elevated course. This last effort of his life to secure the means of improving the noblest calling of mankind was worthy of his fame." The executive committee of the New York State Agricultural Society states that he "had succeeded in securing funds nearly sufficient to put the institution into operation immediately. We know not where to look for his successor; but trust that, that good Providence which has hitherto prospered us will direct to some discreet man to occupy the position of our deceased friend and fellow-laborer."

Of his farming, Mr. Bacon said: "His was a spirit too enlightened, active and untiring, to be satisfied with the results of the past, however honorable to himself. He did not leave a city life to repose in the shades of idleness. Agriculture was to him a new pursuit, and he gave to it the full powers of a cultivated, discerning, energetic mind. No investigation, in the line of his new calling, was too laborious; no useful experiment too detailed, not to command his most careful attention. He learned farming as a science, and became deeply versed in all its branches. His career, since he lived among us, has been marked, and of the highest order of usefulness. He was enthusiastic in his occupation, and infused the spirit of progress, emulation and improvement into those around him. The daily labors of the farm were ended, only to begin his evening record of each day's incidents, results and accomplishments. This journal of the farm was regularly kept by him for many years, and remains a valuable legacy upon a subject of the deepest interest to us, and to the country."

The college at Ovid, N. Y.

Two years after the failure of the college at Fayette, the citizens of the neighboring town of Ovid, in Seneca county, petitioned the legislature to locate the college at Ovid Academy, instead of at Oaklands Farm. The citizens pledged themselves to raise $40,000 and to ask the legislature for an endowment of $200,000. The legislature passed an act on March 31, 1856, authorizing a loan to the Trustees of the State Agricultural College to the amount of $40,000. This loan was to be expended for land and erection of buildings, a mortgage being given upon same to secure repayment twenty years later, without interest. It was stipulated that, as a condition to this loan, the trustees should raise another $40,000. The state loan was to be made on the income of the United States Deposit Fund; but later, the act was amended, so that the amount was made in money from any funds in the treasury. After much discussion, a farm of 686 acres was purchased, amounting to upwards of $45,000, or more than the entire state loan. Possession was taken of the farm by the Trustees on April 1, 1857. The corner-stone of the building was laid July 7, 1859. The college opened

December 5, 1860, with twenty-seven students, but the breaking out of the Civil war brought it to a close the following year. The old building now stands, and is a part of the Willard State Hospital for the Insane, which was established in 1866, on the land on which the state held a mortgage. Parts of the domain that were not mortgaged to the state were sold by the sheriff. In 1862, the trustees asked the legislature for an annual appropriation of $5,000 for five years, to keep the institution alive, but this was refused. The college had become involved financially and otherwise, and it was not in position to avail itself of the benefits of the Land-Grant Act of 1862.

The moving spirit in the transfer of the Agricultural College to Ovid was the Rev. Amos Brown, who became president of Ovid Academy in 1852. When the staff of the college was finally organized, Mr. Brown was not made president; and he subsequently became president of People's College, of which we shall soon hear. Hewett writes as follows of the first organization of the college: "Major M. R. Patrick was president of the faculty; William H. Brewer, a native of Ithaca, and for forty years (1864–1904) professor of agriculture in the Sheffield Scientific School, was professor of agricultural chemistry and botany; Rev. Dr. George Kerr, of Franklin, professor of philosophy and astronomy; and Messrs. Kimball and Mitchell, professor of chemistry and mathematics respectively. In the three years' course of study proposed, the languages were omitted, and the students at graduation were expected to be familiar with all details of a farmer's work, embracing the scientific knowledge of agriculture, landscape gardening, veterinary science, stock-breeding, garden husbandry, plants and grasses, soils, etc." Professor Brewer became connected with the Ovid Academy in September, 1852, and remained till the fall of 1855; he then went to Europe, and returned to the Academy in the fall of 1857, and remained one year, leaving it before the Agricultural College began actual teaching work.

Major Patrick was a graduate of West Point, who had entered the army in 1835, serving in the Indian war, in Florida, and in the Mexican war. He was called again to service in 1862, advancing in rank to Brigadier General and to Brevet General of Volunteers. He was considered to be a very able man and his recall was a great loss to the institution. Major Patrick in his first report outlined the course of study as divided into two terms, one extending from April 15 to November 1, and the other from December 1 to March 1. The full course was to have covered three years. [A paper on "The New York State Agricultural College, at Ovid, and Higher Agricultural Education," was presented in 1906, by the late Hon. Diedrich Willers to the Seneca County Historical Society; and this was published in pamphlet form in 1907.]

People's College.

While the agricultural societies and the friends of agriculture were agitating the subject of agricultural education, the persons engaged in the mechanic industries were also active. Societies of mechanics, and those interested in the mechanic industries, began to be organized before the middle of the last century. An early organization of this kind in New York state was the Mechanics Mutual Protection, which arose as a result of the financial depression that followed the panic of 1837. A convention of mechanics met in Buffalo, July 13, 1843, and formed this society. The purposes of the society were educational, aiming to diffuse a more general knowledge of the scientific principles underlying trades, to protect mechanics and artisans from the encroachment of capitalists and to enable them to secure remunerative wages. The Mechanics Mutual Protection was the result of the labors of Harrison Howard, a resident of Lockport and later of Ithaca.

In the winter of 1848, a movement was started within the society to found a technical school. Subordinate or contributory societies were organized all over the state until they reached some seventy in number. Amongst the persons who early espoused the cause of such a school or college was Horace Greeley, who lent the columns of the New York Tribune to the enterprise. In 1851 a distinct organization was formed to promote the interests of the college for mechanics, as a part of the work of the Mechanics Mutual Protection. Some of the most prominent persons in the state were elected members of this organization, among them being Horace Greeley, William H. Seward, Martin Van Buren, and others. This organization became known as the People's College Association. This association procured promises from political candidates that they would support the movement for the college, and the question, therefore, became a semi-political one. At a meeting held in Rochester, August 1851, resolutions were passed, setting forth the need of an institution of this kind, and stating that if education is to be universal it must be practical. The proposed institution was to be called the People's College. The result of the agitation was the passage of an act of incorporation at an extra session of the legislature, April 12, 1853. Inasmuch as this charter is one of the earliest enactments looking toward the founding of practical schools of mechanics and industries, and is a prophetic document, liberal extracts may be made from it.

The corporation was called "The People's College for the purpose of promoting literature, science, arts and agriculture." It was provided that, whenever the sum of $50,000 shall have been subscribed and paid, the trustees should choose the location of the College.

> The said corporation may grant to students, under its charge, diplomas and honorary testimonials, in such form as it may designate; but such diploma or honorary testimonial shall expressly specify the branches which the student has mastered, and those only. It may also confer such literary honors, degrees and diplomas as are usually conferred by any university, college or seminary of learning in the United States, which diplomas shall entitle the possessors thereof to the immunities and privileges allowed by usage or statute to the possessors of like diplomas from any university, college or seminary of

learning in the state; provided, that no diploma shall be conferred, but in conformity with the laws of the state in force at the time of conferring the same.

6. The capital stock of said corporation shall consist of two hundred and fifty thousand dollars, which may be increased by a majority of the trustees, from time to time, to five hundred thousand dollars; the said stock shall be in shares of one dollar each, and every stockholder shall be entitled to but one vote in the choice of trustees, or any other business which may be determined by the votes of the stockholders.

8. As soon as suitable accommodations are prepared for at least one hundred students, the said trustees shall organize the faculty of the said college by appointing a president, professors, teachers and other officers. It shall be the duty of the said trustees to so arrange the business, and courses of instruction in said college, as to accomplish in the best possible manner:

1. The dissemination of practical science, including chemistry, geology, mineralogy, and those sciences most immediately and vitally essential to agriculture and the useful arts, and to make ample provision for instruction in the classics.

2. To require that every pupil and teacher shall devote some hours, each of five days in each week (excluding Sunday for worship and Saturday for recreation), to bona fide useful labor in some branch of productive industry. The number of hours, however, which such student and teacher shall be required to labor, in each week, shall in no case exceed twenty nor fall below ten; and each student shall be credited with and ultimately paid for the product of his labor, less the cost of qualifying him to perform it effectively.

3. To have agriculture, with the various branches of manufactures and the mechanic arts, systematically prosecuted within the bounds of the college and its grounds, and as a part of its regular course; and no student shall be permitted to graduate with honor until he pass a searching examination with regard to his proficiency in agriculture or some branch of manufacturing or mechanical industry; and every student shall be allowed (with the advice and consent of his parents and guardians, and the faculty) to pursue such branches of learning as he may select, but the faculty shall implicitly require from each student a thorough mastery of those he may choose to follow, which shall be expressed in his diploma; and any student under this condition may prosecute his studies for so many terms only as he, under parental guidance, may be deemed expedient.

4. These several foregoing subsections may be amended at all times by a majority vote of the stockholders, except that the fundamental principles of finding work for and requiring of each pupil and teacher at least ten hours bona fide useful labor per week, and an earnest effort to master some industrial pursuit, shall be held irrevocable, except by a vote of all the stockholders, taken by ayes and nays, and the names of those voting duly recorded.

The agitation for the People's College became widespread and intense. Meetings were held in many parts of the state. The question of the location of the college aroused great interest. At this epoch Charles Cook, of Havana (now Montour Falls), Schuyler county, came forward with a proposition to make up the remainder of the $50,000 needed in order to enable the trustees to locate the institution. Mr. Cook offered a farm and indicated that he would give the institution a liberal grant of money. A meeting of the stockholders was held in Havana, January 5, 1857, and amid intense excitement and casting of 2,984 votes, in person and in proxy, the institution was located in Havana by a majority of 710 votes, and the People's College was definitely launched. In August, 1857, the Rev. Amos Brown, principal of the Ovid Academy, in the neighboring county, who had failed of election to the presidency of the new agricultural college about to be established at that place (page 393), was elected president of the People's College, and Mr. Charles Cook was made chairman of the executive committee and of the building committee. Work was begun on the building.

The financial crisis of 1857 destroyed all hope of raising the necessary funds by means of popular subscription. The agitation for national aid for education in agriculture and the mechanic arts had by that time become widespread, and late in the year 1857 Justin Morrill introduced his Land Grant bill in Congress. The trustees of People's College saw in this an opportunity to secure the needed funds. President Brown went to Washington to aid in the passage of the bill, and the great service that he rendered in that capacity has been suitably acknowledged by Mr. Morrill.

In the meantime, the erection of the building for People's College proceeded, and the corner-stone was laid on September 22, 1858, with an estimated attendance of 15,000 people. Mark Hopkins, president of Williams College, delivered the address.

The Land-Grant Act failed through veto by President Buchanan. Mr. Cook's health failed. Most of the members of the newly appointed faculty became discouraged and resigned. An appeal was made to the state legislature, and an act was passed in April, 1862, appropriating the sum of $10,000 a year for two years to the college; but on technical grounds the comptroller refused to pay this sum. After the passage of the Land-Grant Act, in 1862, great pressure was exerted on the legislature to make People's College the beneficiary. This effort was successful, largely through the efforts of Mr. Cook, now a member of the senate. On the 14th of May, 1862, the legislature transferred the benefits of the Land-Grant Act to People's College. It made conditions, however, that the trustees should show to the satisfaction of the regents, within three years, that the college was provided with a certain number of professors, buildings, and accommodations.

At the expiration of this period the trustees were unable to meet the conditions. Thereupon, Ezra Cornell, who was a member of the state senate, proposed to take the proceeds of the Land-Grant Act under certain conditions and to found an institution. This proposition was accepted by the legislature, after much conflict and discussion, and Mr. Cornell founded the institution which bears his name. Mr. Cornell was himself a farmer, and had been president of the State Agricultural Society. He was in sympathy with all industry, and desired to see it properly recognized in an educational institution of high grade. He expressed the essence of the long succession of agitations in the simple but prophetic phrase, "I would found an institution where any person can find instruction in any study."

Cornell University was a pioneer in establishing the equality of all means of education.

The buildings of People's College were used for a time as a Masonic school and orphan asylum. In 1870, E. W. Cook, younger brother, turned over the property of People's College to establish Cook Academy, which is now in vigorous existence.

It is an interesting coincidence that an agricultural college was finally established in Ithaca, the home of Simeon DeWitt, who pleaded in 1819 for such a school, where one of the very earliest textbooks of agriculture was published (page 383), and where Harrison Howard, prophet of People's College, once lived.

In all this history, the reader must have been struck with the persistent refusal of the state to aid agricultural education by the appropriation of money. It was not until 1904 that, after a stubborn contest, a real state college of agriculture was founded, and not until 1906 that regular maintenance was provided from the state treasury. It is a marvelous thing that legislatures could have resisted such demands for nearly one hundred years; this illustrates with what difficulty the idea of state-maintained education has taken root.

II. The History in Pennsylvania

The present College of Agriculture in the state of Pennsylvania is an outgrowth of the action of the State Agricultural Society. This Society originated in a call dated May 15, 1850 for an agricultural convention to be held at Harrisburg, on January 21, 1851. Among other things considered at this convention was the subject of an agricultural school, and a committee of five persons was appointed to report on a project for it. The result of this action was an application to the legislature for an act of incorporation, which was granted, and approved April 13, 1854. This act provides that the institution shall be known as the "Farmers' High School of Pennsylvania," and it shall be under the control of a Board of Trustees composed of the presidents of the county agricultural societies, and the President and Vice-President of the State Agricultural Society, thirteen of whom shall constitute a quorum. It also legalized the application of $10,000 from the funds of the State Agricultural Society to the purposes of the school. The act contemplated an institution giving an elementary course of scientific and literary instruction combined with instruction in practical agriculture.

The Board of Trustees created by this act was so large as to be practically unmanageable, and a movement was at once set on foot to have the act amended in this regard. The legislature passed a new act and repealed the old one, and this new act became a law on February 22, 1855. This act provides that the institution shall be under the management of a Board of Trustees of thirteen persons, and that the Governor, Secretary of the Commonwealth, President of the State Agricultural Society, and Principal of the institution, shall each be ex officio a member of the Board. The act names the other members of the Board.

After providing for the retirement by lot of the members of the Board not ex officio, the law provides that these nine places shall be filled by vote of the members of the Executive Committee of the State Agricultural Society and the votes of three representatives duly chosen by each county agricultural society. In respect to funds the act provides as follows: "That it shall be lawful for the Pennsylvania State Agricultural Society to appropriate out of their funds to the object of this act a sum not exceeding ten thousand dollars, whenever the same shall be required, and to make such further appropriations annually, out of their funds, as will aid in the prosecution of this object, and it shall be the duty and privilege of the said Society, at such times as they shall deem expedient by their committees, officers or otherwise, to visit the said Institution, and examine into the details of its management." The Board of Trustees organized the following June and began at once to consider the question of sites for the new school. The third meeting of the Board of Trustees was held at Harrisburg, September 12, 1855, when the farm offered by Gen. James Irvin, in Center county, was chosen; and this is the site of the present Pennsylvania State College.

The Board of Trustees now applied to the legislature for an appropriation of $50,000 to aid in constructing and equipping the buildings for the school. The legislature made such a grant in a law that was approved May 20, 1857. This act appropriated $25,000 at once to the Farmers' High School in view of $25,000 having already been secured by subscription; and it appropriated an additional $25,000 in case a like sum should be raised by subscription. This gave the institution $50,000 at once, with a contract on hand for the building at $55,000.

An annual meeting of delegates for the election of trustees was held at the school September 2, 1857. A dinner-table was spread in the barn. Judge Frederick Watts, President of the Board of Trustees, made an able address outlining the proposed work of the institution. He estimated that $100 per annum would fully cover all expenses of a student for board and tuition.

It was soon found to be difficult to raise money by subscription, partly due to the financial depression of 1857. Greatly embarrassed, the Board sought aid of the legislature. In the meantime, however, the school was opened February 16, 1859. The following description of the opening, by Dr. Pugh, will afford a vivid picture of the difficulties under which the early colleges of agriculture began their work: "Wm. G. Waring, who had been superintending the farm, garden, and nursery for some time previous, was now appointed General Superintendent of the College, and Professor of Horticulture; S. Baird, Professor of Mathematics; R. C. Allison, Professor of English Literature; J. S. Whitman, A.M., Professor of Natural Science. Prof. Baird resigned May 18, 1859, and the Board at that time assembled appointed Prof. David Wilson in his stead. Over one hundred pupils had engaged places, and sixty-nine were present on the first day of opening; during the session 119 students were entered, though there were never more than about one hundred present at any one time, owing to the dismission and expulsion of some and the withdrawal of others. The school was opened under innumerable difficulties and disadvantages. The buildings were only partially finished, and in the absence of the intended dining-room and kitchen a board shantee, which could neither be kept warm in cold nor dry in wet and stormy weather, was used to cook and eat in. Proper apartments for museums, laboratories, and recitation rooms were wanting. The farm was yet rough, and the lumber and materials for mason and brick work for the completion of the building, were piled around in shapeless masses on all sides of the latter, rendering it almost impossible to get about it, and presenting a most forlorn aspect to the students, who first entered the college, through the well-tramped mud of the breaking up the winter frosts."

On December 7, 1859, the nineteenth meeting of the Board of Trustees was held at the College. Instructions were given to prepare the first annual catalogue, and the following faculty was nominated: Evan Pugh, Ph.D. and F.C.S., President; David Wilson, A.M., Vice-president; William G. Waring, General Superintendent of the Horticultural Department; J. S. Whitman, A.M., Professor of Botany; R. C. Allison, A.M., Professor of English Literature.

Fig. 109. Evan Pugh.

The financial difficulties now becoming so acute, a solicitor was appointed to secure funds for the School. The movement to ask the legislature for an outright appropriation now took definite shape, and a bill appropriating $50,000, for completing the buildings, passed the senate on the 10th of April, 1861. Dr. Pugh, in making announcement of the passage of this act, follows it with this sentence: "Fort Sumter was bombarded about this time, and the country was in the midst of the excitement consequent thereon." The passage of this act was regarded as a great victory, for it was held that a great agricultural state was thereby saved the disgrace of allowing an agricultural college that it had attempted to found to break up in the act of being founded, and the $150,000 worth of property that had been collected was saved from being sacrificed.

The third session of the school was opened early in the year 1861, with a reduced number of students because of the unsettled condition caused by the Civil war, although eighty-eight were recorded in the third annual catalogue published at the close of this session. In this year the first class graduated, the degree of Bachelor of Scientific Agriculture being conferred on eleven persons

A movement was now set on foot to change the name of the institution, and it became known as the "Agricultural College of Pennsylvania."

Purpose, and course of study.

In a pamphlet drawn up by a committee of the Board of Trustees, in 1862, but written by Dr. Pugh, the objects of the institution are set forth with some detail. The institution was to be, (1) "a purely educational institution," its course of instruction to include the entire range of the natural sciences; (2) "a practical institution" in which actual agriculture was to be taught; (3) "an experimental institution" for the developing of the principles of agricultural science; (4) "a means of protecting the industrial interests of the state," as, for example, from the sale of bad or worthless or too high-priced material, such as manures, seeds, plants and implements.

The courses of study as set forth in this publication are as follows:

> The first year the Student studies Arithmetic, Elementary Algebra, Horticulture, Elementary Anatomy and Physiology, Physical Geography and Elementary Astronomy, English Grammar and Composition, Elocution, History, Practical Agriculture and the details of management on the College Farm. Students, who have mastered the common school branches, will be prepared to enter the classes of this year. In order to be fully prepared for it, they are advised to pay particular attention to Grammar, Geography, Reading, Writing, Spelling and Arithmetic.
>
> *Second year.*—Advanced Algebra and Geometry, General Chemistry, Vegetable Anatomy and Physiology, Zoology and Veterinary, Geology, Paleontology, Practical Agriculture and Horticulture, Logic and Rhetoric. Students who are sufficiently far advanced in Algebra, Geometry and English Grammar, are admitted to this class without respect to the other studies of the first year.
>
> *Third year.*—Surveying, Navigation, Levelling, Drafting with the use of Instruments, Analytical Geometry, Trigonometry, Elementary Calculus, Natural Philosophy, Chemical Analysis, Veterinary Surgery, Entomology, Agricultural Botany, Practical Agriculture and Pomology, Political and Social Economy. Students who have mastered Davies' Legendre and Trigonometry, and who possess a corresponding degree of knowledge of the English branches generally, and who have gone through a good academical text-book course of Natural Science, are admitted to this class.
>
> *Fourth year.*—Analytical Geometry, Differential and Integral Calculus, Engineering, Drafting, Mechanical Drawing, Quantitative Chemical Analysis, Veterinary Pharmacy, Gardening, Agricultural accounts and Farm Management, Moral and Intellectual Philosophy.
>
> The ability to enter this year's course is dependent so

> much on the Students having gone through the studies of the preceding year, and the latter being peculiar to an Agricultural College, of which there are no others in the country, no students prepared to enter it are likely to apply.
>
> Students who successfully complete this course of studies, and pass a satisfactory examination, and prepare a dissertation of not less than fifteen pages of foolscap paper, upon some scientific or literary subject (if scientific, it must embrace an original investigation), approved by the faculty, and whose general standing in the school shall have been good, shall, upon there commendation of the faculty, have the degree of Bachelor of Scientific and Practical Agriculture, B.S.A., conferred upon them by the Board of Trustees of the College.
>
> *Course for graduates.*
>
> *Fifth year.*—Students who after having taken the degree of B.S.A. shall devote three years to Practical Agriculture, or to any intellectual pursuit or profession, shall take the degree of Master of Scientific or Practical Agriculture, M.S.A., or, if they remain another year in the Institution, and devote their time to special investigation, they can take this degree at the termination of the year.
>
> Private Laboratories, with means for investigation, will be fitted up for graduates of this or any other College, in which to pursue prolonged, special, scientific investigation. Graduates of Literary Colleges, who may only have pursued an ordinary text-book course in science, and who wish to devote some time especially to science, in connection with agricultural practice, can take any part of the above course, or devote themselves to scientific investigation with the graduates of the fifth year, at the same time they are familiarizing themselves with the details of agricultural practice on the farm.

It was also provided that in addition to the full course there should be a "Partial Scientific and Practical Course" and "a Practical Course." The former course omitted mathematics for the benefit of "many students who are incapable of making progress in mathematical studies." The latter course was designed for those who desired a brief period of instruction, much after the manner of various "special courses" now offered in the colleges. It was provided that all "Applicants must have attained the age of sixteen years, and present satisfactory certificates of good moral character and industrious habits; and must also have a good knowledge of the elementary branches of the common school course. On entering, they must consider themselves pledged to conform to all the rules and regulations of the Institution, among which is the daily performance of three hours' manual labor."

State maintenance; plan of an industrial college.

Dr. Pugh soon saw that liberal endowment must be provided if an educational institution devoted to the industries was really to make any headway as against the established institutions of so-called liberal culture. In 1864 he published "A report upon a plan for the organization of colleges for agriculture and the mechanic arts, with especial reference to the organization of the Agricultural College of Pennsylvania." This was a plea for state support. In the report he outlined the scope of an industrial college, expressing his opinion as to what such an institution should have in the way of officers and assistants, buildings, apparatus and collections and library, means of scientific investigation, prizes and scholarships, plan and course of instruction, endowment, and how such institutions might use the Land Script Fund which had recently been appropriated by Congress. As a basis for his argument he made a statistical review of the endowment and expenditures and other factors in the leading colleges of the day. It is interesting at this time to reproduce his table, showing the resources of the leading American educational institutions:

TABLE SHOWING THE EDUCATIONAL RESOURCES OF THE MORE PROMINENT AMERICAN COLLEGES.

Colleges	No. of professors	No. of students	Amount paid professors and teachers	Amount of endowment	Annual expenses	No. of volumes in library
Bowdoin College	18	181	. . . .	*$182,000	. . . .	30,595
Dartmouth College	20	307	$13,000	217,667	$17,907	35,402
Harvard University	56	833	68,000	1,613,884	153,431	149,000
Amherst College	17	229	. . . .	*590,000	18,500	30,000
Brown University	12	202	. . . .	220,000	36,000	37,000
Yale College	40	617	. . . .	. . . .	78,000	75,000
Columbia College	43	689	52,000	1,650,666	79,269	18,000
University, City of New York	36	488	. . . .	*250,000	14,011	10,000
New York Free Academy	25	916	42,000	†	52,590	10,000
Union College	17	276	19,400	658,000	30,000	18,000
Rochester University	11	160	10,950	123,224	13,408	7,000
Vassar Female College	. .	. .	. . . .	408,000	. . . .	. . .
Princeton College	13	221	. . . .	. . . .	. . . .	22,200
University of Pennsylvania	28	642	. . . .	306,654	26,844	8,000
Philadelphia High School	19	502	. . . .	. . . .	23,430	. . .
Girard College	13	400	. . . .	2,000,000	85,000	. . .
University of Michigan	27	286	. . . .	600,000	40,000	8,000
University of Illinois	38	. .	. . . .	427,625	. . . .	. . .

*In these, some property which does not afford any income is included.
†This institution is wholly supported by the city of New York.

His statements of the reasons for maintaining an industrial college are clear and strong. At that day, science was subordinated to the literary studies and it was, therefore, necessary to make a plea for instruction in science and to champion the work. He set forth with much conviction the fact that the endowment for scientific work should be as great as that for literary work, and he makes the following plea in respect to the executive officer of such an institution as he has in mind: "It is more important that the presiding officer of a Scientific College should be a scientific man than that the same officer in a Literary College should be well versed in literary studies, because the expenditures for material, as auxiliaries to study in a Scientific College must always be great, and they are such as can only be properly regulated, encouraged and controlled by a scientific man. No scientific Institution ever has been, or ever can be successful as such, the control of which, either directly or indirectly, is not vested in a scientific man. An appeal to experience, no less than a consideration of the intrinsic nature of the question will demonstrate this fact."

The professors and assistants which he deemed necessary to the complete establishment of an industrial college are as follows (which is one of the most advanced plans of the time): (1) A Professor of pure Mathematics and the higher Mechanics and Astronomy. (2) A professor of Civil Engineering and Applied Mathematics. (3) A Professor of Natural Philosophy and Astronomy, Mechanics and Physics; an assistant, to prepare experiments for lectures, and to teach classes in the physical laboratory, where students would learn the art of experimentation with philosophical apparatus. (4) A Professor of Pure Chemistry; an assistant to help prepare lectures and look after classes in the laboratory; a sub-assistant to take charge of the chemicals, and to help in the laboratory, with no other salary than free tuition. A chemical department, embracing laboratory instruction, cannot be efficient with less aid than one professor and two assistants. (5) A Professor of Agricultural Chemistry and Geology; an assistant to help with field experimentation and work in the laboratory. (6) A Professor of Metallurgy, Mining and Mineralogy and Chemical Technology; an assistant, to prepare lectures and help in the laboratories. (7) A Professor of Anatomy, Physiology and Veterinary. (8) A Professor of Natural History, more particularly of Zoölogy, Comparative Anatomy and Entomology. (9) A Professor of Botany Horticulture and Entomology; one assistant, to take charge of the greenhouse, and give field instruction in Horticulture, and a gardener, to take charge of the garden. (10) A Professor of Practical Agriculture; as assistant, he should have a practical farmer of the highest attainments in his art, and the latter should be assisted by two good farm hands, and by all the students in the College. (11) A Professor of the English Language and Literature. (12) A suitable Professor to take charge of a Commercial Department. (13) A Professor of Modern Languages.

To these thirteen professorships or departments, he would advise the adding of (14) a Professor of the Latin and Greek Languages and Literature; (15) a Professor of Military Art, and Science and Teacher of Military Tactics; (16) a Treasurer, Book-keeper and Librarian.

Omitting the organization of the culinary department, the summary of the staff of such an institution would be as follows:

President and professors	16
Librarian and treasurer	1
Assistants	10
Superintendents	2
Total	29

The summary of the financial resources that would be needed by such an institution are as follows (special attention is called to the fact that he provides for "scientific investigation"):

EXPENDITURES

Sixteen professors at $1,500	$24,000 00	
Ten assistants	4,000 00	
A farm superintendent	700 00	
Janitor and helps	1,000 00	
		$29,700 00
For additions to museums, to scientific apparatus, and to library		5,000 00
For scientific investigation		5,000 00
For indigent students, orphans of soldiers, free scholarships, etc.		7,000 00
For repair of buildings		1,000 00
Total expenditures		$47,700 00

INCOME

Four hundred students at $50 per annum	$20,000 00
Income required from endowment	27,000 00
	$47,000 00

This ambitious and commendable plan did not materialize from direct state aid. The Land-Grant Act of 1862 was transferred to the College, and the institution began its course of continuous but slow evolution, as did the institutions in other states. In 1874, the present name, "The Pennsylvania State College," was assumed.

III. MICHIGAN

To Michigan belongs the distinction of having the oldest agricultural college now in operation in North America. The statute creating it was passed by the legislature February 12, 1855; and the college was opened May 13, 1857, more than five years before the signing of the Land-Grant Act by President Lincoln. The first class of seven members was graduated in 1861.

Moreover, the Michigan institution was the first to be founded directly on full state support, without popular subscription, or the organizing of a stock company or corporation. The control was from the first embodied in a state board or commission. The necessity of a college or school for agriculture was recognized in the state constitution, adopted in 1850. The college therefore is one of the recognized and fundamental state institutions, being established on the complete acceptance of the theory that the state should maintain education of all grades. This theory is, of course, the full expression of the provision for education in the ordinance of 1787 for the government of the Northwest Territory. In the thirteen original states, a different theory, or at least a different practice, obtained; and the results of it persist to this day.

The clause in the constitution providing for an agricultural college, is as follows:

> Article XIII, Section 11. The legislature shall encourage the promotion of intellectual, scientific and agricultural improvement; and shall, as soon as practicable, provide for the establishment of an Agricultural school. The Legislature may appropriate the twenty-two sections of Salt Spring lands now unappropriated, or the money arising from the sale of the same, where such lands have been already sold, and any land which may hereafter be granted or appropriated for such purpose, for the support and maintenance of such school, and may make the same a branch of the University, for instruction in agriculture and the natural sciences connected therewith, and place the same under the supervision of the Regents of the University.

The necessity of agricultural education was recognized in Michigan before it became a state; and in 1837, the year in which it was admitted to the Union, the University of Michigan was established, and branches were to be opened in different parts of the state, not more than one in each county; and it was provided that "in each branch of the University there shall be a department of agriculture, with competent instructors in the theory of agriculture, including vegetable physiology and agricultural chemistry, and experimental and practical farming and agriculture." From that time on, the discussion seems to have been continuously before the public. When the State Normal School was established by law in 1849, one of its objects was to be, "to give instruction in the mechanic arts, in the art of husbandry and agricultural chemistry."

The State Agricultural Society.

The directing influence underlying the establishment of the state agricultural school or college lay with the State Agricultural Society. Early in 1849 a call was issued by the state officers and members of the legislature for the establishment of an agricultural society; in pursuance of this call, a meeting was held in the Hall of the House of Representatives at Lansing, on March 10, 1849, with Governor Ransom presiding. A committee of seven was appointed by the chair to report a plan of organization. Another meeting was held March 17, 1849, at which time the State Agricultural Society was organized. The constitution declared the objects of the Society to be "to promote the improvement of agriculture and its kindred arts throughout the State of Michigan." It was resolved that Lieutenant Governor Fenton be asked to address a meeting at the succeeding Saturday evening, March 23, at which time it was proposed to complete the organization of the Society. Governor Fenton's address was a general plea for the recognition of the material and intellectual advantages of agriculture. He draws a picture of the "busy hum of industry" even then surrounding the state Capital, the site of which, less than two years before, had been in "the solitudes of the dark forest."

In this first year of the existence of the Michigan State Agricultural Society, the question of education by means of agriculture came up for discussion, and this discussion never ceased until the State Agricultural College was organized and well established. At a meeting of the Executive Committee on December 19, 1849, Bela Hubbard introduced a resolution asking, "that our legislature be requested to take such legislation as shall appear necessary or expedient for the establishment of a State central agricultural office, with which shall be connected a museum of agricultural products and implements, and an agricultural library, and as soon as practicable, an agricultural college and a model farm." Mr. Hubbard supported this resolution with an address of explanation; the motion however, was laid on the table. In January, 1850, however, a memorial was sent, under Mr. Hubbard's leadership, to the legislature asking for "a State Agricultural College in Michigan." The discussion before the legislature of means for agricultural education had marked effect, for on April 2, 1850, a joint resolution by the Senate and House of Representatives was approved, calling on the senators and representatives in Congress to use all honorable means to procure of the United States a donation of three hundred and fifty thousand acres of land to the State of Michigan "for the purpose of establishing and maintaining agricultural schools therein, at such places and under such regulations as the Legislature thereof may prescribe." This joint resolution also asked for a donation of ten thousand acres of land to the Michigan State Agricultural Society, to aid "in establishing and maintaining a central office and library;" it also asked for "the passage of a law to establish a bureau of agriculture in the department of the interior, or in some other appropriate department of Washington, whose province shall be to superintend and promote the great interest of agricultural improvements in the nation."

The demand for a separate institution.

The Executive Committee of the State Agricultural Society stood for a separate college of agriculture. The State Normal School, at Ypsilanti, and the State University at Ann Arbor, both opposed a separate college, and desired also that agriculture should be a part of their respective institutions. On September 21, 1852, Francis W. Shearman, Superintendent of Public Instruction, wrote a letter to the Society, explaining the efforts that the State Normal School was making to give instruction in agriculture. He called attention to the clause in the organic law requiring this school to teach these subjects, and says: "A concentration of the means afforded by the State for the advancement of agriculture must be considered an object of importance, at all events, for years to come. The State Normal School has been permanently endowed with twenty-five sections of Salt Spring Lands, which will yield sufficient revenue in time, to carry out all the purposes designed in its establishment. The class of young men who are to be expected as pupils in the institution will be those who have been, for the most part, engaged in the pursuit of agriculture, and who will, in most cases, after securing that kind of education, which will be afforded in it, return to that pursuit within the borders of our own state. The great interests of education and agriculture, therefore, can be there most practically identified and cherished."

In December, 1852, Henry P. Tappan, Chancellor of the University, also wrote to the Society, outlining the attitude of the University. Dr. Tappan called attention to the provision in the constitution looking toward the appropriation of twenty-two sections of the Salt Spring Lands for the maintenance of the agricultural school, and to the contemplated connection of this work with the University, and proceeds:

"In anticipation of this legislative grant, we have accordingly organized an Agricultural School, as a part of the scientific course recently adopted by the Faculty and Regents.

"The following subjects are embraced in the agricultural course:

"(1) Daily lectures on Chemistry (elementary and experimental), Chemistry applied to the arts, meteorology and climate.

"(2) Geology and Mineralogy, and the application of the same to mining, drainage, construction of public works, etc., illustrated by specimens from Michigan, the neighboring states and foreign lands; also models and drawings.

"(3) Animal and Vegetable Anatomy and Physiology in general, the physiology and diseases of domestic animals in particular, and the structure and habits of insects in reference to grain, trees and horticultural plants.

"(4) Organic Chemistry and the theory and practice of agriculture, the origin and nature of soils, the different varieties of manure, tillage, tools, etc.

"Lectures on these subjects will be given during the next Spring and Summer term, commencing May 1st and ending June 30th."

Dr. Tappan was requested by the Executive Committee of the Society to deliver the address before the Society at its Fair in September, 1853. In this address, Dr. Tappan made the following statements in regard to the province of the university: "I say, Farmers of Michigan, that our great desire is to make the University useful to you, and we are determined to do it. We will educate all your sons who wish to be educated for the different professions. We will educate those who wish to take a particular course to fit them for a particular business. We will educate those who wish to become strictly literary and scientific men. And beyond all this, we have established and will carry on an Agricultural Department for those who intend to devote themselves particularly to Agriculture. Whatever be the determination of the people of this State in respect to an Agricultural School, we know not how to teach Chemistry, Botany, Mineralogy and Zoölogy, without giving a course of agricultural science. The scientific perfection of our scheme of studies demands it. We shall do this independently of any consideration as to the disposition of the lands appropriated by the State for agricultural education. Our aim is to make the University one of the first in our country, and, if we can, second to none in the world; and therefore, there is no branch of knowledge that we can lawfully omit."

On March 14, 1853, a circular was issued by the regents of the University of Michigan, announcing that a free course of lectures on agricultural science would be given at the University from April 27 to June 28 of that year. The Rev. Charles Fox was announced as the lecturer on "Theoretical and Practical Agriculture." Mr. Fox was an Englishman, educated at Rugby, and rector of the Episcopal church at Grosse Isle, near Detroit. Other lectures were given by Professor Douglass, of the geological department, and by Professor Sager. Mr. Fox published his lectures in 1854 in the form of a text-book (page 384). Fox soon thereafter removed to Ann Arbor; he lectured during the winter, and was soon thereafter appointed "Professor of Theoretical and Practical Agriculture." He died after filling the university position less than two years. He worked in harmony with the State Agricultural Society, and was its delegate to a meeting in Washington of the United States Agricultural Society.

Led by J. C. Holmes, the able secretary of the Michigan Agricultural Society, that organization persistently advocated the establishment of a separate institution. It was contended that such new and practical kind of education as was contemplated could not thrive in connection with a university. The new institution must stand alone and make its own ideals. The section in the state constitution apparently provided that the State College of Agriculture should be a part of a department of the State University. The Society contended, however, that it was only permissive in this respect. It is recorded that those persons at whose suggestion this section was placed in the constitution desired to have the college or school of agriculture independent of all other institutions; but that others of the members, thinking that it would be economy to connect it with the University, and having in view the embarrassed pecuniary condition of the state at that time, were unwilling to try the experiment of establishing a separate institution, and therefore the matter was compromised by adopting the conditional phraseology. The question of the separateness of the proposed school from the University was much discussed when the constitution was made.

Founding of the College of Agriculture.

In December, 1852, the Society appointed a committee to urge on the legislature the establishment of such an institution on a farm of not less than 640 acres. This resolution provided a temporary connection with the University and a final establishment of an independent agricultural school. In accordance with this resolution, a petition was prepared to be circulated among the county agricultural societies and others; these petitions were presented to the legislature in 1853, but the legislature did not comply with the request.

The society appointed S. M. Bartlett, of Monroe, to draft a bill for the establishment of the agricultural school, to present to the legislature of 1855. The bill was put into shape by Hon. Isaac P. Christiancy, of Monroe, subsequently chief justice of the supreme court of the state, and also United States senator. Governor Bingham, in his message to the legislature on January 4, 1855, recommended the establishment of an agricultural school. The legislature passed the bill substantially as drawn by Mr. Christiancy, and it became a law by the approval of the governor February 12, 1855. Inasmuch as this is probably the first legislative enactment to found an agricultural college on a complete state basis, the original law may be given in full:

AN ACT for the establishment of a State Agricultural School.

Section 1. *The People of the State of Michigan enact*, That the president and executive committee of the Michigan State Agricultural Society be and are hereby authorized to select, subject to the approval of the State Board of Education, a location and site for a State Agricultural School, within ten miles of Lansing; and subject to such approval, contract for and purchase for the State of Michigan such lands, not less than five hundred acres, nor more than one thousand acres, in one body, for the purpose of an experimental farm and site for such Agricultural School: *Provided*, That the amount to be paid for such farm and site shall not exceed fifteen dollars per acre, and that the conveyance or conveyances be made to the State of Michigan.

Sec. 2. There is hereby appropriated twenty-two sections of salt spring lands, or the money arising from the sale thereof, referred to in Article 13, Section 11, of the constitution of the State of Michigan, for the purchase of land for such site and location, and the preparation thereof, the erection of buildings, the purchase of furniture, apparatus, library and implements, payment of professors and teachers, and such other necessary expenses to be incurred in the establishment and successful operation of said school.

Sec. 3. Upon the execution and delivery to the Secretary of State of the proper conveyance or conveyances of land, the purchase of which is provided for in the first section of this act, and the certificate of the Attorney General that he has examined the title to the same, and finds it unencumbered, and that the conveyance or conveyances are executed in due form, and a certificate from the president and secretary of the Board of Education, that the same is in accordance with the contract or contracts for the purchase of the same, and that the location has been approved by them, the Auditor General shall draw his warrant or warrants on the State Treasurer for the amount of such purchase, in favor of the party or parties to whom such sum or sums shall be due, payable out of said salt spring lands, or money accruing from the sale of the same; and the said certificates in this section mentioned shall be filed and preserved in the office of the Secretary of State.

Sec. 4. Upon the purchase of such location and site, there shall be established on such site, under the direction and supervision of the State Board of Education, an Agricultural School, by the name and style of the Agricultural College of the State of Michigan, and the chief purpose and design of which shall be to improve and teach the science and practice of agriculture.

Sec. 5. The course of instruction in said college shall include the following branches of education, viz: an English and scientific course, natural philosophy, chemistry, botany, animal and vegetable anatomy and physiology, geology, mineralogy, meteorology, entomology, veterinary art, mensuration, leveling and political economy, with book-keeping and the mechanic arts which are directly connected with agriculture, and such others as the Board of Education may from time to time see fit to prescribe, having reference to the objects specified in the previous section; and the said board may establish such professorships, and employ such professors and teachers, to be called the Board of Instruction of said college, for the instruction aforesaid, as they may judge best for such object: *Provided*, That the sum paid such professors and teachers, for the first year after said college shall go into operation, shall not exceed the sum of five thousand dollars, and for the next year, not exceeding the sum of six thousand dollars, and for any years thereafter, such a sum as the State Board of Education may deem necessary, for the successful operation of the institution. Tuition in said institution shall be forever free to pupils from this State, and any number of pupils may be admitted who shall apply from any part of this State: *Provided*, That in case more pupils apply than can be accommodated or taught, then said board shall adopt some equitable plan, giving to each county a number according to the ratio of population, as it shall appear from the census last taken; and in that case, those from each county shall be admitted in the order in which they shall apply, until the quota of such county be full.

Sec. 6. There shall be two scholastic terms in each year, the first term commencing on the first Wednesday in April, and ending on the last Wednesday in October, the second term commencing the first Wednesday in December, and ending on the last Wednesday in February; and no pupil shall be received for less than one term, unless by special permission from the Board of Instruction.

Sec. 7. The Board of Education, upon consultation with the Board of Instruction, shall, from time to time, fix and establish rules as to the number of hours which shall be devoted to manual labor and to study, which may be different in different terms or seasons; but during the first term in such year, the time devoted to labor shall not be less than three nor more than four hours each day; and no student or pupil of said college shall be exempt from such labor, except in case of sickness or other infirmity.

Sec. 8. The Board of Education shall appoint one of the professors in said college to be the president thereof, and one to be its secretary, and one to be its treasurer; and the Board of Instruction may establish such rules and regulations from time to time, for the government of said college and instruction therein, as they may deem proper in any matter not regulated by the Board of Education; and the rules and regulations adopted by such Board of Instruction shall remain in full force until altered by said Board of Education. And the said Board of Instruction shall have power, subject to the approval of the Board of Education, to establish by-laws for the government and discipline of the pupils of said college, in regard to conduct and behavior, and to affix such pecuniary penalties as they may deem proper, and to prescribe the causes for expulsion or dismissal of any such pupil, which by-laws shall have the force of law, unless altered, modified or repealed by the Board of Education or the Legislature; and the Board of Education shall fix the compensation to be credited or paid for the labor performed by pupils, under the provisions of section seven of this act.

Sec. 9. The president of said Board of Instruction shall preside at all meetings of said board, except in cases of sickness or absence; in which case the board may elect one of their number president *pro tempore*; and it shall be the duty of the president to see that all the regulations established by this act by the Board of Education and by the board of instruction, in regard to the government and instruction in said college, be enforced.

Sec. 10. The secretary of said board of instruction shall record all the proceedings of said board, and all regulations and by-laws for the government of said college, and shall publish the same, and furnish a copy thereof to the Governor of this State, to each member of the Board of Education, to the county clerk of each county, and to the clerk of each organized township in this State. He shall also keep a full record of all improvements and experiments made on said lands, their costs and results. He shall also keep a careful account with each field, in connection with a plan of the farming lands or farm, exhibiting the position of each, in which shall be shown the manner and cost of preparing the ground, the kind of crop, time of planting or sowing, and after condition, the time and manner of harvesting, the labor devoted to each process, and its cost price, with the cost of preparing the matured crop, for market, and the price for which it was sold, and of such other matters as the Board of Education and of instruction, or either of them, may require of him; and he shall furnish a copy thereof at the end of each term to the president of the Board of Education; and the said record shall, at all reasonable hours, be open to the inspection of any citizen of this State.

Sec. 11. The treasurer shall receive and keep all moneys arising from the sale of products of the farm, and from fines and penalties that may be imposed; and shall give bonds in such sum as the Board of Education may require. He shall pay over all moneys upon the warrant of the president, countersigned by the secretary, on account of such contingent expenses of the institution as may arise. He shall render annually, in the month of December, to the Board of Education, and as often as required by said board, a full and true account of all moneys received and disbursed by him; stating for what received and paid, and shall produce vouchers for such payments. The surplus money, if any remain in his hands at the time of rendering such account, shall if required by said board, be paid over to the State Treasurer, to be placed to the credit of said institution.

Sec. 12. After said college shall have commenced its first term, the Superintendent of Public Instruction shall appoint visitors for the same, who shall perform the like duties required by such visitors by law, in reference to the State Normal School.

Sec. 13. This act shall take effect immediately.

Approved February 12, 1855.

Agitation for removal.

Even after the site for the new college was procured near Lansing, the subject of the location of the school was not considered to be settled. It is said that the state capital itself had been located in the woods at Lansing because contending factions could not agree, and that they considered the vote was only a truce, pending the change of location at some future time; likewise, it is said that the requirement of the bill to locate the college within ten miles of Lansing, on land to cost not over fifteen dollars an acre and to consist of not less than five hundred, or more than one thousand acres in one body, was also a compromise measure unsatisfactory to the friends of the institution, and that there were those who thought that the location of the school at this place would be only temporary. An appropriation of forty thousand dollars was made, however, February 16, 1857, for the erection of buildings, purchase of furniture, apparatus, implements and library, and for the payment of professors and teachers, and to maintain the farm for the years 1857 and 1858. Work was at once begun on the college, and it was opened to students on May 13, 1857. The agitation for the removal of the institution continued, however. One of the clearest statements of the reasons for connecting the College with the University, even after the passage of the act, was made by Prof. Alexander Winchell, of the State University, in a letter dated March 10, 1855, to the Agricultural Society. He enumerates the chief causes that had led to the separation as follows: jealousy of centralization; the fear that a scientific, technical education would not be furnished by the University; the fear that if connected with the University, the College would not be sufficiently under the control of the State Agricultural Society. The reasons for advocating its connection with the University were stated as follows: Such connection would result in great saving of money in the first outlay; it would result also in great saving in the subsequent maintenance; such connection would make for superior instruction; "the particular principles of scientific agriculture constitute properly an inseparable part of university instruction;" such a union would tend to the centralization of the educational resources of the state rather than the dispersion and dissipation of them. In 1859 a bill was introduced to turn the college over to the State University, but it was lost. The contention was not finally settled until 1869, when a carefully prepared bill was introduced providing for the transfer of the College to Ann Arbor as a department of the University. This bill was defeated; an appropriation was made to the Agricultural College; and the question was settled.

The college begins work.

This somewhat full outline of the movements in Michigan is necessary to an understanding of the schism that rose upon the passage of the Land-Grant Act of 1862, between the old-established literary colleges, and the proposed agricultural colleges. Michigan led the way for separation, and about half of the States followed its example. The Michigan College made great headway, and soon came to exercise a dominating influence on agricultural education in this country. It was not until forty years after the founding of the Michigan Agricultural College that the colleges and departments established in connection with universities began to find themselves, and to make great headway.

The officers of the college at its opening in 1857 were as follows: "Joseph Ricketson Williams, M.A., President and Director of the farm; John Clough Holmes, Professor of Horticulture, and Treasurer; Lewis Ransom Fisk, M.A., Professor of Chemistry; Calvin Tracy, M.A., Professor of Mathematics; Robert D. Weeks, Professor of English Literature and Farm Economy, and Secretary; Enoch Banker, Assistant in Chemistry; James M. Shearer, Steward."

President Williams resigned in the spring of 1860. He died in 1861. He was a Massachusetts man, and was graduated from Harvard with the class of 1831. He was State Senator in Michigan in 1861.

An announcement of the college was issued December 10, 1856, by Ira Mayhew, Secretary of the State Board of Education, under whose control the Agricultural College and the Normal School were placed. Inasmuch as this is the first announcement of a real state agricultural college, it may be given here in full:

> MICHIGAN AGRICULTURAL COLLEGE.
>
> The Agricultural College of the State of Michigan is located three miles east of the village of Lansing, upon a farm of nearly seven hundred acres. The West Wing of the College Buildings, and a Boarding House, have been erected, and arrangements will be made for opening the Institution the first Wednesday of April next.
>
> As but a limited number of students can be accommodated, owing to the want of the necessary buildings, and as applications from the various counties of the State are entitled to preference in the order of time in which they are made, it becomes important that persons, desirous of securing situations, make their applications for admission at an early day. These may be made to the Secretary of the State Board of Education, by letter, at Lansing, any time before the fifteenth day of January.
>
> Age and scholarship of applicants.
>
> Applicants for admission as pupils must have attained the age of fourteen years, and must have acquired a good primary school education.
>
> Tuition and board.
>
> Tuition will be free to pupils from this State. Arrangements will be made to accommodate students with board, at reasonable rates, in the boarding house on the premises
>
> Manual labor.
>
> Every student will be required to devote a portion of each day to manual labor, for which he will be entitled to receive an equitable remuneration.
>
> Course of study.
>
> The course of study has been arranged with direct reference to the wants and interests of the agricultural class in our State. It will embrace a wide range of instruction in English Literature, in Mathematics, and in Natural Science. Special attention will be given to the Theory and Practice of Agriculture in all its departments and minutiæ
>
> Term-time and attendance.
>
> The First Term of the Institution will commence the first Wednesday in April, and will end on the last Wednesday of October. The Second Term will commence the first Wednesday in December, and end on the last Wednesday of February. Students will not be received for less time than one term, unless for special reasons satisfactory to the Board of Instruction. Persons desirous of admission, should present themselves for examination at the College the Monday previous to its opening.
>
> By order of the State Board of Education.

In 1861 a State Board of Agriculture was created to have charge of the college; and this provision remains to the present day, the State Agricultural Society continuing its work as theretofore.

The ideas that were paramount in the early days of agricultural education are well reflected in the courses of study; and a comparison of the old course with those in vogue at the present day, will show what the evolution has been. The course offered by the Agricultural College of Michigan, in 1861, was as follows:

First year.
- Geometry.
- Meteorology.
- History.
- Trigonometry and surveying.
- Elementary chemistry.
- English literature, book-keeping.

Second year.
- Physics.
- Vegetable physiology and horticulture.
- Rhetoric.
- Civil engineering.
- Botany, horticulture and mineralogy.
- Inductive logic.

Third year.
- Drawing and rural engineering.
- Geology.
- Mental philosophy.
- Astronomy.
- Zoölogy.
- Moral philosophy.

Fourth year.
- Analytical chemistry.
- Animal physiology.
- Political economy.
- Agricultural chemistry.
- Entomology, veterinary medicine, economy of domestic animals.
- Agricultural and geographic botany.
- Technology, household and rural economy.

This sketch of the Michigan history may well be closed by an appreciation of John Clough Holmes. (Fig. 110.) For many years Mr. Holmes was closely connected with the agriculture of Michigan. In 1852, he established the Horticultural Gazette, which afterward united with the Michigan Farmer, of which he became horticultural editor. He was greatly interested in all matters which pertained to pomology and was instrumental in affecting the organization of a number of local horticultural societies in the southeastern part of the state. In 1849, he was elected secretary of the State Agricultural Society, and as a result of his untiring efforts and his insistent advocacy and memorials, the state of Michigan provided for the establishment of the agricultural college in 1855. Of his work President Abbot said, "To no one man is the college so much indebted as to John Clough Holmes, the first secretary of the State Agricultural Society. Into the project of establishing the school of agriculture and horticulture he entered with singular zeal and devotion. He collected information from all quarters, and there were no features of organic law which he had not discussed with those best qualified to give advice, and none of them that do not show his shaping hand. During nearly the whole legislative winter of 1855 he was in Lansing diffusing a knowledge of the plan and awakening an interest in it and this was done at his own private expense. Mr. Holmes gave the college his personal assistance as professor of horticulture during the years 1857, 1859 and 1861. He did much to lay out and beautify the grounds and give the college 'a right start.'" He was connected with the Detroit Scientific Association, and the State Pioneer Society. Mr. Holmes died at Detroit, December 16, 1887. He was born September 25, 1809, at Salem, Mass.

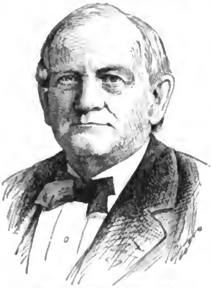


Fig. 110. John Clough Holmes.

IV. Connecticut

We have already found (pages 368, 369) that the desire for agricultural education developed early in Connecticut; but these examples do not appear to be connected directly with the founding of state and Land-Grant institutions. The Land-Grant institution established itself first at Yale, and we may now consider the antecedent history.

Agricultural instruction, particularly along chemical lines, developed early at Yale. These beginnings are stated as follows by Professor Brewer:

"Agricultural instruction began in Yale College long before there was any curriculum of agricultural studies, in the sense in which that word is now used. Almost as soon as chemistry was taught in the college, its applications to agriculture formed a part of the general course of lectures upon chemistry, and after a time specific lectures on agricultural chemistry are said to have been delivered. They certainly were delivered by professors outside of the college course. Professor B. Silliman, Jr. (1816 to 1885) delivered, by invitation, a course of lectures on agricultural chemistry, in the winter of 1845-46, in the city of New Orleans. Students came for private instruction in chemistry, for its agricultural applications, before the Scientific School was founded, even in its rudimentary form.

"The Department of Philosophy and Arts was established in 1846. At that time John P. Norton was appointed Professor of Agricultural Chemistry and Vegetable and Animal Physiology, and Professor B. Silliman, Jr., was appointed Professor of Chemistry and the Kindred Sciences as applied to the Arts; but in the catalogue of that year nothing is said about this, more than the names of the professors given in the list of instructors.

"Professor Norton had already studied chemistry here, and two years in Europe in agricultural chemistry, under Professor Johnston, of Edinburgh, and there had made a specific investigation of the chemistry of oats. He felt, however, that he was not then qualified to teach agricultural chemistry adequately, and he declined to have the title of Professor of Animal and Vegetable Physiology applied to him, and appeared after that in the college catalogue only as Professor of Agricultural Chemistry. He returned to Europe and studied a year with Mulder, the celebrated Dutch agricultural chemist of that day, and the next college year, in the fall 1847, he and Silliman opened the laboratory called the 'Yale Analytical Laboratory,' which was a part of the Department of Philosophy and Arts. He began immediately his instruction in agricultural chemistry, as well as in general chemistry. These were continued, either by him or by his successors, until a few years ago, when this school ceased to be the agricultural college of the state. Out of this work, Professor Norton developed his text-book (1850) called 'The Elements of Scientific Agriculture' (page 383).

"The school began to increase about 1850; the engineering department was added in 1852, when it became known as the 'Yale Scientific School.' In 1860, it had still further enlarged, and came to be known as the 'Sheffield Scientific School.' Agricultural chemistry and agricultural investigations were carried on during all this period continuously, but there was no curriculum of agricultural studies in the modern sense of that word. The analysis of commercial fertilizers began as early as 1851, and for many years was prosecuted under the auspices of the State Agricultural Society; and I may say that this line of work continued until the state was induced to establish a State Agricultural Experiment Station.

"After the Morrill Land-Grant was passed, the state made Yale College the recipient of the grant coming to the state, in 1864, and a definite course in Agriculture was planned during that year, and which began in the fall of that year, several new professors being appointed in the school."

"The catalogue of 1847-48 has a list of 'Students in Philosophy and Arts,' which includes graduates pursuing other studies. From the announcement of studies in that department, so much of the catalogue as has any bearing on the subject in hand is here reproduced:

Professor Silliman, Jr., will instruct in Elementary and Analytical Chemistry, Mineralogy and Metallurgy.

Professor Norton will instruct in the applications of science to Agriculture and in Analytical Chemistry.

School of Applied Chemistry

Professors Silliman and Norton have opened a Laboratory on the College grounds, in connection with their departments, for the purpose of practical instruction in the applications of science to the arts and agriculture. Every facility will be afforded to those who desire to obtain special instruction in general and in analytical Chemistry and Mineralogy. A course of lectures on the connections of science with Agriculture, by Professor Norton, will commence in January and continue about two months, at the rate of four lectures in each week. Professor Silliman, Jr., will deliver during the summer a course of lectures upon some other department of applied chemistry.

Students in this department will have access to mineralogical and geological cabinets, and scientific libraries. The text-books used in this department will be Dana's Mineralogy, Silliman's Chemistry, Will's Outlines of Analysis, Fresenius's Analysis, and Johnston's Lectures on Agricultural Chemistry and Geology.

The lectures on Chemistry by Professor Silliman, Senior, commence the first week of the first term, and continue through the term. His lectures on Mineralogy are delivered during the second term, and those on Geology commence the first week of the third term and continue six weeks. The lectures of Professor Olmsted, on Natural Philosophy, commence about the middle of the first term, and continue at the rate of two a week nearly through the year. His lectures on Astronomy and Meteorology commence at the beginning of the second term, and continue, daily, for about seven weeks.

In 1864, Professor William H. Brewer became Professor of Agriculture in the Sheffield Scientific School; and he participated in the early movements for agricultural education in this country, particularly in the formative period of the Land-Grant institutions. (Pages 378, 393.)

One of the first institutes, or educational convocations, was held at Yale College during the month of February, 1860. The immediate suggestion for a convocation of this kind appears to have been made by the periodical, New Englander, in November, 1859. These suggestions seem to indicate so well the state of expectation in respect to agricultural education at that time that they may be reproduced:

> There is little question in the public mind as to the importance of new agencies for the diffusion of agricultural knowledge. A more difficult question is, how the lack of them shall be supplied. The Press does much, but by no means all that is required. The contact of man with man, and of mind with mind, is necessary to inspire the enthusiasm which is essential to rapid progress.
>
> The introduction of books on elementary science into our Common Schools would be a great step in advance; but here again there is the absence of that contact of the man of knowledge with the men who need it, which is essential to the highest success.
>
> Shall we wait for the establishment by Government of great agricultural institutions, similar to those of continental Europe? Such institutions are among the most obvious and essential wants of our time, but a public and general opinion of their utility and necessity must be created before either our State or National Governments will seriously consider their establishment. Shall we await the results of private enterprise and beneficence in the creation of agricultural institutions, with their model farms and costly apparatus of instruction, and their corps of professors, exclusively devoted to the business of instruction? For these also we should have long to wait, not so much because of the want of liberality among those who have the means to endow such institutions, as for the lack of a clear conviction as yet of their utility, and the really practical character of the information they would supply.
>
> It has seemed to us that this problem of a more perfect diffusion of knowledge on agricultural subjects is capable of another solution than that which consists in devising means for obtaining governmental appropriations, or awaiting the munificence of individuals.
>
> In the attempts which have hitherto been made in this direction, too exclusive reliance has been imposed, as it seems to us, on purely professional instruction; and it has been wrongly assumed that it is necessary to await the gradual production of a class of men qualified to impart it. No necessity exists, as we believe, to await the creation or production of anything that does not now exist, for the accomplishment of this great work. The material is at hand. We have undiffused knowledge among us in every department of agriculture and horticulture, and of science applied to cultivation, as minute and profound as exists anywhere on the face of the earth.
>
> In accordance with this view, the solution which we propose is the enlistment of practical men, who are not professional teachers, in the work of instruction, and their combination in such numbers, that a small contribution of time and labor from each shall make a sufficient aggregate to meet the object in view. The special necessity for such a system, in the case of the pursuit we are considering, grows out of the fact that there is much in agriculture which has not, as yet, taken the form of Science, and can only be acquired from practical men.
>
> We are all familiar with the immense results accomplished by combinations of capital in commercial enterprise, in banking, in railroad projects, in manufacturing. The combination which is practicable in agriculture is of another kind—the association of intelligence and knowledge in the work of instruction, for the indirect attainment of great results in this most important of all fields of human labor.
>
> To realize such association of knowledge we would, then, assemble from the farm, the garden, the nursery, the vineyard, and from the ranks of science, gentlemen distinguished for their skill in the various specialties of agriculture—practical and theoretic,—and call on them to make each his contribution to the work of instruction. And then we would summon the intelligent and enterprising farmers of the country, young and old, to gather and learn from the most highly qualified among their own number, the secrets of their success. We would propose that such aggregations of knowledge, as have been suggested, should be made at as many different points in the country as the available material would warrant, and that the instruction they would furnish should be adapted as exactly as possible, in time and extent, to the circumstances of our agricultural population.
>
> Such gatherings would partake of the character of the agricultural convention, on the one hand, in which experienced cultivators meet for their mutual enlightenment; and on the other hand, of the agricultural college, within whose walls the less experienced assemble to take advantage of the deliberations of the former, and to listen also to their formal instruction.

The Yale Scientific School took up the suggestion, and an "Agricultural Convention" was held. Professor John A. Porter was the moving spirit in this important assemblage. S. W. Johnson, (page 381), professor in Yale 1856 to 1896, and now Emeritus, helped to plan these lectures; and he has been influential in the development of good educational ideals. The lectures were reported in the New York Tribune, and these reports were put into book form, in 1860, by Henry S. Olcott, under the title, "Outlines of the First Course of Yale Agricultural Lectures" (from which the preceding quotation is made). These excellent lectures ran through four weeks, and they were given by specialists from various parts of the country. The first week was devoted to agricultural chemistry and plant physiology; the second largely to pomology; the third to "agriculture proper;" the fourth to domestic animals. In practice, however, the schedule seems to have been modified to some extent. The book of lectures, which runs to 186 pages, closes with directions, by Samuel W. Johnson, for the conducting of field experiments on the agricultural uses of salt.

In 1881, an Agricultural College was established at Storrs, and sometime afterward all agricultural instruction was discontinued at Yale.

V. OTHER STATES

While it is not the purpose of this writing to search out and record all the movements that descended directly into the Land-Grant state colleges, enough should be said to indicate the spread of the early agitation and the ideas that dominated it. Therefore, brief statements of efforts in certain other states may be mentioned.

Maryland.

At a meeting of the New York State Agricultural Society, September 12, 1849, John Delafield, presiding, said that in "the excellent and thrifty state of Maryland, the necessity of agricultural education had already excited the public attention. An appropriation was made at the last session of the legislature for the establishment of a professorship of agriculture." Prof. Higgins, "agricultural chemist of Maryland" spoke at the meeting. He is reported to have said that "the legislature [of Maryland] was solicited, for several years, to diffuse a knowledge of the different soils throughout the State. A law was passed creating a professorship of agriculture, whose duty it should be to examine the different soils, and give lectures in every section of the state for the benefit of all. Thus every one would become instructed as to the composition of his soil, and the manures best adapted for it. An agricultural school would be a great benefit, but while knowledge was being acquired there, the present generation was suffering from the want of it." The professorship was not attached to an institution.

Before 1850, definite recommendations had been made in Maryland looking toward agricultural education in the schools and elsewhere. The question was discussed before the Maryland State Agricultural Society. The matter was presented to the legislature, and on March 6, 1856, an act was passed to establish and endow an "Agricultural College in the State of Maryland."

The reasons for establishing such a college are set forth by the law as follows: (Chapter 97.)

> Whereas, it hath been represented to the Legislature, that certain wise and virtuous citizens, are desirous of instituting and establishing in some convenient locality within this State, an Agricultural College, and Model Farm, in which the youthful student may especially be instructed, in those arts and sciences indispensable, to successful Agricultural pursuits, and whereas,
>
> It doth appear to this Legislature that while the wise and learned in the present age have cultivated with laudable industry and applied with admirable success the arts and sciences to other pursuits, the most necessary, useful and honorable pursuits of agriculturists have so far been most lamentably neglected; and whereas,
>
> It is the province and duty of the Legislature to encourage and aid the philanthropic and patriotic citizens in their efforts to disseminate useful knowledge, by establishing an Agricultural College, and Model Farm, which shall, in addition to the usual course of scholastic learning, particularly indoctrinate the youth of Maryland, theoretically and practically, in those arts and sciences, which, with good manners and morals, shall enable them to subdue the earth and elevate the State to the lofty position its advantages in soil, climate, etc., and the moral and mental capacities of its citizens entitles it to attain.

The institution was a stock company, with provision for an annual maintenance grant from the legislature of $6,000. Certain commissioners were provided, who were authorized to receive subscriptions in shares of $25 each to an amount not exceeding $5,000.

Nearly five hundred persons subscribed, and the institution was speedily organized. A farm of 428 acres, part of it still occupied by the college, was purchased, and the corner-stone of the main building was laid August 24, 1858. The doors of the institution were opened for teachers, investigators and pupils in September, 1859. The building was suitable to house laboratories, apparatus, classrooms and quarters for pupils.

The troublous times of 1860 and 1861 arrested the development of the plans. The subsequent years left the charter members of the organization in a condition that deprived them of the privilege of prosecuting the work on the scale at first conceived. The college was continuously in operation in these years, however, despite the difficulties, and its work has suffered no intermission to the present day. It is the beneficiary of the Land-Grant Act. The first class was graduated in 1862, consisting of two students, receiving the degrees B.S. and A.B.

The shareholders and their heirs still retain a half interest in the property of the college. The state promptly fulfilled its part of the contract, by appropriating $6,000 "as an annual endowment, to be applied to the payment of salaries of professors and such other purposes as shall promote the welfare and success of the said agricultural college."

A noteworthy feature of this institution is the recognition of experiments in agriculture, in the original law of 1856. The phraseology is as fol-

Plate XVIII. Truck-gardening. Carrots on Long Island, New York, above; celery at Great Meadows, New Jersey, beneath

lows: "It shall be the duty of the said board of trustees to order and direct to be made and instituted on said model farm annually a series of experiments upon the cultivation of cereal and other plants adapted to the latitude and climate of the State of Maryland, and cause to be carefully noticed upon the records of said institution the character of said experiments, the kind of soil upon which they were undertaken, the system of cultivation adopted, the state of the atmosphere, and all other particulars which may be necessary to a fair and complete understanding of the result of said experiments . . ."

Kansas.

The Charter of Bluemont College, Manhattan, Kansas, February 9, 1858, under the control of the Methodist Episcopal church, provided for the establishment of a literary college, but also contained a provision to establish "an agricultural department, with separate professors, to test soils, experiment in the raising of crops, the cultivation of trees, etc., upon a farm set apart for the purpose, so as to bring out to the utmost practical results the agricultural advantages of Kansas, especially the capabilities of the high prairie lands." This provision is interesting also in view of the fact that in the early days "high prairie lands" were considered to be of small account for farming purposes. This institution became the foundation of the Kansas State Agricultural College on the passage of the Land-Grant Act.

Iowa.

In 1858 the legislature of Iowa passed an act appropriating $10,000 for the establishing of a college that should uphold the dignity of manual labor. The act provided that each student of the college should engage in manual labor not less than two hours a day in winter and three in summer. The appropriation was barely sufficient to purchase a farm; but this forming institution became the nucleus of the present Iowa State College, on the passage of the Land-Grant Act.

Wisconsin.

The following record is quoted from "Higher Education in Wisconsin," by Allen and Spencer, United States Bureau of Education. "As early as 1851, the regents had urged the need of a department of the practical applications of science, and also a school of agriculture. These were then subjects of intense and wide-spread interest throughout the country, and public opinion was forcing the colleges to take measures for providing facilities for scientific and technical studies. The report of 1851 was, therefore, largely taken up with the subject, and year after year the hope was expressed that by means of national or state bounty the university might be able to comply with the public sense and demand in these directions. But it was not until 1854 that the first advance was made; in that year the regents were able to provide specially for the teaching of natural science. In May, S. P. Lathrop entered upon the duties of professor of chemistry and natural history. A small appropriation of one thousand dollars for chemical and philosophical apparatus was expended in judicious purchases by Professor Lathrop. He died in December, 1854, and a year passed before his place was filled by the appointment of Dr. Ezra Carr to the vacant position. Professor Carr delivered a course of lectures on agriculture, chemistry, and the application of science to the useful arts, but the limited time, the lack of appliances, and the limitation of the instructional force to one professor, made the work in mechanics and agriculture entirely superficial and inadequate. This was due, not to any lack of ability or fitness in the professor, but the very necessities of the case in the infant institution." The University of Wisconsin received the Land-Grant benefits, and the College of Agriculture is part of it.

Massachusetts (page 369).

In 1845, the legislature incorporated the Massachusetts Academy of Agriculture in Worcester county for the purpose of conducting instruction in agriculture. Marshall P. Wilder, who was long known for his public work, was one of the incorporators. In 1848, the Massachusetts Agricultural Institute was incorporated "for the purpose of establishing in some one of the towns lying on the banks of the Connecticut river, or in a town immediately adjoining such towns, an agricultural school and experimental farm." One of the incorporators was Edward Hitchcock, President of Amherst College.

Thereafter. followed a long series of discussions and reports looking to the founding of a school or college of agriculture in the Connecticut valley. These efforts finally terminated in the opening of the Massachusetts Agricultural College at Amherst, across the town from Amherst College, in 1867 (grant accepted, and trustees incorporated, 1863; college located, 1865); and although so much of the early agitation for instruction seems to have risen from Amherst College, there developed in time a spirit of antagonism between the two institutions, which now, however, has subsided: this repeats in Massachusetts what occurred in all the older states in various forms, when education for agriculture began to make headway.

The following quotation is from George Gary Bush, in "History of Higher Education in Massachusetts" (Circular Information, No. 6, 1891, United States Bureau Education): "The first effort to establish in Massachusetts an institution where scientific and practical agriculture should be taught was made in 1849, by Hon. Marshall P. Wilder, in an address delivered in September of that year before the Norfolk Agricultural Society upon the subject of agricultural education. The suggestions contained in this address were received with so much favor that the following year (1850) a bill was prepared providing for the establishment of an agricultural college and an experimental farm. This bill passed the senate without a dissenting vote but was rejected in the house. The next step was in the creation of a board of commissioners, whose duty should be to report, at the next session of the legislature, upon the expediency of establishing agricultural schools or colleges. This commission, which consisted of Marshall P. Wilder, Edward Hitchcock and others, made their report to the legislature in 1851. This report embraced the investigations of Dr. Hitchcock in regard to the agricultural schools and colleges of Europe and contained an account of more than three hundred and fifty of these institutions. Nothing further was done toward organizing a College of Agriculture till 1856. In that year several of the gentlemen who had been most active in the project for planting a college now associated together for the establishment of a school, and obtained an act of incorporation under the title of the Massachusetts School of Agriculture. Of the persons named in this act the name of Marshall P. Wilder heads the list. In 1860, its charter was transferred to several enterprising citizens of Springfield, who determined to raise by subscription $75,000 for the opening of the school in that city, relying upon the legislature for a further endowment. This project would probably have succeeded had not the call to arms absorbed public attention."

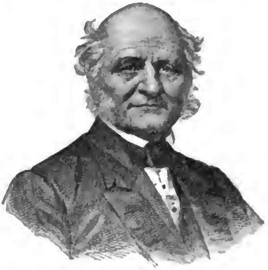


Fig. 111. **Marshall Pinckney Wilder.**

Mr. Wilder (Fig. 111), as president of the United States Agricultural Society, exerted much influence at Washington in the passage of the Land-Grant Act, a service that was acknowledged by Mr. Morrill.

New Hampshire.

Probably the most interesting fact in New Hampshire history with reference to the establishment of agricultural education is the making of a will by Benjamin Thompson, about 1854, giving all of the residue of his property, after certain bequests, to establish an agricultural college on his farm in Durham. Mr. Thompson died in 1890, and, under the will, the money was not available for twenty years after his death. In 1893, the New Hampshire College was removed to Durham, and the agricultural work at Dartmouth College was discontinued, and the Land-Grant funds were transferred. In 1910, the college at Durham will avail itself of this fund, which will then amount, approximately, to eight hundred thousand dollars.

Illinois.

The moving spirit for industrial education in Illinois, and what was then "the West," was J. B. Turner (Fig. 112). He made an address before the Teachers' Association at Pittsfield, in 1850, on industrial education, and before the Farmers' Convention at Granville, on November 18, 1851, the second one becoming famous. He also repeated these ideas in an article for the press ("Millennium of Labor") in 1853. No school or institution was founded by Turner; but his ideas are incorporated in the State University and in similar schools elsewhere. The State University, at Urbana, received the Land-Grant proceeds, and the College of Agriculture is a part of it. The following sketch, comprising the remainder of the article, of Professor Turner, is prepared for this occasion by Eugene Davenport.

Jonathan B. Turner was born on the farm at Templeton, Massachusetts, December 5, 1805; and died at his home in Jacksonville, Illinois, January 10, 1899.

He was one of the remarkable characters of his time. Graduating with the highest honors from Yale, he immediately decided to cast his lot with the pioneers, and in 1832 emigrated to Illinois, where he took a professorship in Illinois College at Jacksonville. Failing health soon compelled him to retire to the farm, but he exercised during life a powerful influence on both the material development of the West and the educational progress and scientific thought of the country at large. His practical turn of mind and his originality are illustrated by the fact that he was one of the first to plant corn by machinery. Realizing the need of fences on the unbroken prairie, he scorned the

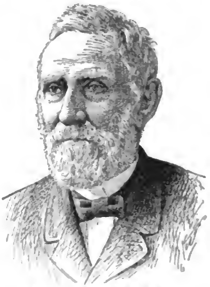


Fig. 112. **Jonathan B. Turner.**

regions roundabout for a suitable hedge plant, finally introducing the Osage orange from the Ozark mountains. He was exceedingly influential in the establishment of state and county fairs in what was then the West, and he early advocated a national highway to extend from the Atlantic to the Pacific.

His conscientious fearlessness was illustrated by the fact that he was a prominent member of the "underground railway" in the 1850's and a special friend of Owen Lovejoy, who was killed at Alton. His life was many times threatened and his home was actually burned over his head, but nothing deterred him.

A giant in mind as well as in stature, his intellect seemed to grasp all things in their true relations, and he early saw and always advocated the need of a new form of education for industrial people. He recognized that the old academic education, founded on the classics and dealing with materials foreign to the life of industrial people, operated naturally to draw the individual out of the industrial life and into the professions which this form of education was designed especially to serve. In this way, the industrial people as such failed to be educated, and the industries, instead of profiting by the advantages of education, were in fact injured thereby.

In his famous address at Granville, Ill., he outlined a "Plan for an industrial university." This address made a great impression not only in Illinois, but over the country at large. It is printed in the Patent Office report for 1852, and there are many reasons for supporting the position of his friends that this address and subsequent correspondence from Professor Turner constituted the chief inspiration of Senator Morrill in his famous Land-Grant bill of 1862, providing for the establishment of an industrial college in every state.

He was a voluminous correspondent, and such men as Webster and Douglas were his confreres. It is one of the regrets of the time that a large mass of this most valuable correspondence was destroyed when the home was burned. He and Lincoln were young men together, and, as Turner taught Lincoln mathematics, the two dreamed out together the hope for a new education in the practical things of life. (The writer of this sketch had this from Professor Turner's own lips.)

That the range of his mental activity was as phenomenal as its character, is shown by a list of his most conspicuous writings, a few of which are here appended: Microscopic Insects; Preparation and Rotation of Crops and Soils; Soil Analysis; Essays on the Currency (declared by Daniel Webster to be one of the best he ever read on the subject); Mormonism in All Ages; Practical Education; Insect Life; Three Races of Men; Practical Culture; Metaphysical Analysis of Matter, Forces and Spirit; Need of a National Bureau of Agriculture, and, most famous of all, his "Plan" for a national system of industrial education, of which Judge Douglas said: "This educational scheme of his [Turner's] is the most democratic scheme of education ever proposed to the mind of man."

Virginia.

The General Assembly of Virginia by the act of January 25, 1819, named "principles of agriculture" as one of the subjects to be taught in the University of Virginia, but the first actual teaching of the subject seems to have been in 1869, following a gift to the University by Samuel Miller of Lynchburg. In 1822 an effort was made to establish a chair of agriculture in the University. The subject was pursued by Edmund Ruffin, beginning as early as 1833; in 1853 the State Agricultural Society awarded him a prize for an essay on agricultural education. The Land-Grant institution is at Blacksburg.

Mississippi.

As the result of a discussion extending through several years, the legislature of Mississippi in 1850 passed an act providing for "the payment of the salary of a professor and assistant professor of agricultural and geological sciences" in the University of Mississippi, and also for "a general geological and agricultural survey of the state." After some delay and amendment, the survey was begun, and the subsequent work of E. W. Hilgard in this survey is notable. This movement at the university did not result, however, in applying the Land-Grant to that institution.

Georgia.

In 1854, Dr. William Terrell, of Hancock county, Georgia, gave $20,000 to what is now the University of Georgia, "the annual interest of which shall be applied permanently as compensation for a professor, whose duty it shall be to deliver in the college, a course of lectures, during its terms, on 'Agriculture as a Science; the Practice and Improvement of Different People; on Chemistry and Geology, so far as they may be useful in Agriculture; on Manures, Analysis of Soil and Domestic Economy, particularly referring to the Southern States;' the lectures to be free." He recommended for appointment as "the first professor, Dr. Daniel Lee, who has spent twenty years of his life, in the study and practice of agriculture, and who will bring to its duties all his skill and a zeal that ought to insure success." The gift was accepted, and Dr. Lee (pages 378, 390) was appointed. The University of Georgia is the recipient of the Land-Grant fund; and the proceeds of Dr. Terrell's gift are still applied to the purposes for which he made the bequest.

VI. National Legislation

The wide-spread and long-continued agitation for education in agriculture expressed itself more and more in a demand for support by state and nation. This demand culminated in the passage of the Land-Grant Act in 1862, giving to each state a certain amount of land, the proceeds from the sale of which were to be used in colleges of agriculture and the mechanic arts. The long agitation was personified in Justin S. Morrill, representative, and later, senator, from Vermont, who framed the bill and secured its enactment.

Enactment of the Land-Grant Act.

A statement of the events in the legislation of the Land-Grant Act was prepared in December, 1885, by Senator Morrill's direction, and is now published from the manuscript in the possession of Cornell University. In submitting the statement, Mr. Morrill wrote, "I do not remember that I ever heard a hint of it [the agricultural college bill] from any quarter, until it was brought out by myself." Mr. Morrill's statement follows:

"On the 14th of December, 1857, Mr. Morrill of Vermont introduced a bill (H. R. No. 2) in the House of Representatives, 'Donating public lands to the several states which may provide colleges for the benefit of agriculture and the mechanic arts,' and moved its reference to the Committee on Agriculture.[1] Mr. Letcher, of Virginia, moved its reference to the Committee on Public Lands, and this motion was pending when the House adjourned on the announcement of the death of Senator Butler of South Carolina. On December 15th the motion was debated and the bill referred, December 16th, to the Committee on Public Lands, which Committee, by Mr. Cobb, its chairman, reported it back adversely, April 15, 1858, submitting majority and minority reports, the latter mainly written by Mr. Morrill at the request of Mr. Walbridge. Motions were made by Mr. Walbridge, of Michigan, to print and postpone consideration until April 21st, and by Israel Washburn, Jr., of Maine, to recommit, which motions were on the 20th instant withdrawn and a substitute offered by Mr. Morrill to be recommitted to the Committee on Public Lands.

"Mr. Cobb moved to lay the bill on the table, which motion was rejected. On the 22d of April the House again refused to lay the bill on the table and also refused to recommit; the substitute was agreed to, and the bill passed the House by a vote of 105 to 100, and went to the Senate, where it was referred April 23d to the Committee on Public Lands who reported it back with amendment May 6, 1858. After being considered from time to time and receiving amendment, it passed the Senate as amended February 7, 1859, by a vote of 25 to 22. The amendments were concurred in by the House and the Act went to the President (Buchanan) who, on the 24th of February, 1859, returned it with his veto, and a message giving at length his reasons therefor. The House received the message on the 26th instant, and Mr. Morrill submitted some remarks showing why the bill should be passed, the President's objections notwithstanding; but the measure, not receiving the necessary two-thirds, failed to become a law.

"On the 16th of December 1861, Mr. Morrill again introduced in the House a bill 'Donating public lands, etc.' (H. R. 138), which was referred to the Committee on Public Lands. While it was held in this Committee, the majority of which were hostile to the measure, Senator Wade of Ohio was asked by Mr. Morrill to introduce the bill in the Senate, and on May 5, 1862, a bill (S. 298), identical with H. R. 138, was introduced by him and referred to the Senate Committee on Public Lands who reported it back with an amendment May 16, 1862. The bill was considered from time to time, and finally passed the Senate June 10, 1862, and the House of Representatives, without reference to Committee, June 17, 1862. It became a law July 2, 1862.

"To secure its passage it was necessary to take the bill when it was received from the Senate, and obtain the action of the House thereon without allowing it to be referred to a hostile committee. This was done on motion of Mr. Morrill, who moved the previous question upon the passage of the bill, and, in the midst of some rather sharp opposition, carried a majority of the House for the bill."

Mr. Morrill championed the bill. He founded his arguments not only on the necessity of industrial education to the development of the people, but also on the fact that large grants of land had been made from the remaining national domain for other purposes, and that thereby the older states were disadvantaged in comparison; that the average productiveness per acre was diminishing in the northern and eastern states, and that they would soon depend for food stuffs on the newer states, whereas the productiveness of the land in England appeared to be undiminished, and that, therefore, some institution of a high grade for instruction in agriculture was necessary to check the decline; that the education offered in colleges was almost exclusively for the professional classes, while the greatest number of people were engaged in productive and industrial employments.

The adverse majority report, on April 15, 1858, laid great stress on the fact that the states had reserved to themselves the authority to act in their domestic affairs, and that these principles established the only solid foundation for the perpetuation of a federal union. The report held that the distribution of these lands to industrial education would not result in accomplishing the greatest good for the greatest number of people, to which purpose the national domain should properly be reserved. The minority report, mainly written by Mr. Morrill, on request, insisted not only on the need for such institutions, but also that a grant of land to aid in the establishing of such institutions would be quite as much to the interest of all the states as a grant of land to aid in the construction of railroads and other works and to aid old soldiers. The report denied that the measure would be in any sense a donation to the states, inasmuch as it would relieve them from no taxation, but would impose new duties. It would merely make the states trustees for certain purposes which they could constitutionally and effectively discharge.

President Buchanan's main objection was based on constitutional grounds, the question being whether congress had the power to make a donation of public lands to the different states to provide colleges for the purpose of educating the inhabitants of those states. Other objections were the fact that the difficulty of raising revenue would be increased, because the government would be deprived of the income from the sale of great quantities of public lands; that strained relations might result between the federal government and the state governments following such action; that the bill would operate to the injury of the new states, as it would be a temptation for wealthy persons to acquire large tracts of public lands and hold them for speculation; that it was a question whether the bill would actually accomplish the ends for which it was designed; that the passage of the bill would interfere seriously with the colleges already existing in the different states, in some of which agriculture was already taught.

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[1] When the bill was introduced in the House of Representatives by Mr. Morrill in 1857, he was a member of the Committee on Agriculture where he wanted to have it referred. The House was controlled by the Democratic party and generally adverse to the bill. Therefore it had to take a hostile reference to the Committee on Public Lands.

Many persons in many states supported the bill, by speech, letter, petition and otherwise. Two or three men outside of congress were very prominent in their efforts on behalf of the hill, among whom were Rev. Amos Brown, of New York, Marshall P. Wilder, President of United States Agricultural Society, and J. B. Turner, of Illinois. At the request of Professor Turner (page 408), both Abraham Lincoln and Stephen A. Douglas had promised to sign the bill in case of their election.

It seems to have been acknowledged at the time, that some of the most important outside help was rendered by Mr. Brown (page 393). He was then president of the newly organized People's College, at Havana, N. Y. He was one of the staunchest advocates of his time for industrial education, anticipating many of the suggestions and points of view of educators of the present day. On hearing of the introduction of the bill in congress, he went to Washington and spent much time in efforts in its behalf, interviewing President Lincoln as well as members of congress. This help was acknowledged by Mr. Morrill. Some members of congress thought that the bill would not have passed had it not been for Mr. Brown's efforts.

Amos Brown was born in Kensington, N. H., March 4, 1804. His early boyhood was spent on the farm. He prepared for college in the Academy at Hampton, N. H. He had designed to study medicine, but in the Academy this purpose was changed, and he entered Dartmouth in 1829 with the purpose of studying theology. He supported himself during his college course by means of teaching. After his graduation in 1832, he entered Andover Theological Seminary, his course there being interrupted by an absence of one year, when he was principal of the Academy at Fryeburg, Me. After leaving Andover, he became principal of the Academy at Gorham, Me., and there he remained for twelve years. His success as a teacher and organizer was so marked that Gorham Academy attracted the attention of Horace Mann and others. He later became a Congregational pastor for a time, but returned to teaching at the Seneca Collegiate Institute, Ovid, N. Y. Here he gathered a small and brilliant company of young men, many of whom have since come to be well known in professional work. He was influential in securing the charter for the State Agricultural College, to be located at Ovid, in connection with the Academy. He died at Havana, N. Y. (now Montour Falls), August 27, 1874. He was a man of great enthusiasms, and, although his life was checkered, he never understood defeat.

The Land-Grant Act is probably the most important single specific enactment ever made in the interest of education. It recognizes the principle that every citizen is entitled to receive educational aid from the government and that the common affairs of life are proper subjects with which to educate or train men. Its provisions are so broad that the educational development of all future time may rest on it. It expresses the final emancipation from formal, traditional and aristocratic ideas, and it imposes no methods or limitations. It recognizes the democracy of education, and then leaves all the means to be worked out as time goes on.

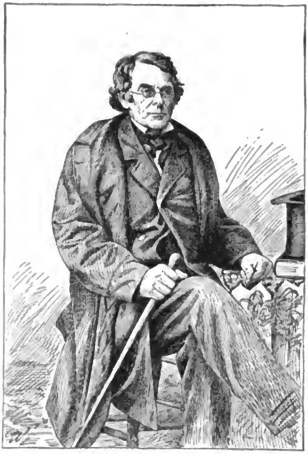


Fig. 113. Amos Brown.

"The fundamental idea" of the Land-Grant Act, said Senator Morrill in 1888, "was to offer an opportunity in every state for a liberal and larger education to larger numbers, not merely to those destined to sedentary professions, but to those much needing higher instruction for the world's business, for the industrial pursuits and professions of life." "The useful was to have greater prominence in the eyes of students, as it will have in all their after-life, and not stand unequal and shame-faced even in the presence of ancient literature."

Text of the Land-Grant Act, or First Morrill Act.

Public Laws of the United States, 1862, Chapter 130.
Approved by President Lincoln, July 2, 1862.

An act donating Public Lands to the several States and Territories which may provide Colleges for the Benefit of Agriculture and the Mechanic Arts.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That there be granted to the several States, for the purposes hereinafter mentioned, an amount of public land, to be apportioned to each State a quantity equal to thirty thousand acres for each senator and representative in Congress to which the States are respectively entitled by the apportionment under the census of eighteen hundred and sixty: *Provided,* That no mineral lands shall be selected or purchased under the provisions of this act.

Sec. 2. *And be it further enacted,* That the land aforesaid, after being surveyed, shall be apportioned to the several States in sections or subdivisions of sections, not less than one quarter of a section; and whenever there are public lands in a State subject to sale at private entry at one dollar and twenty-five cents per acre, the quantity to which said State shall be entitled shall be selected from such lands within the limits of such State, and the Secretary of the Interior is hereby directed to issue to each of the States in which there is not the quantity of public lands subject to sale at private entry at one dollar and twenty-five cents per acre, to which said State may be entitled under the provisions of this act, land scrip to the amount in acres for the deficiency of its distributive share: said scrip to be sold by said States and the proceeds thereof applied to the uses and purposes prescribed in this act, and for no other use or purpose whatsoever: *Provided,* That in no case shall any State to which land scrip may thus be issued be allowed to locate the same within the limits of any other State, or of any Territory of the United States, but their assignees may thus locate said land scrip upon any of the unappropriated lands of the United States subject to sale at private entry at one dollar and twenty-five cents, or less, per acre: *And provided, further,* That not more than one million acres shall be located by such assignees in any one of the States: *And provided, further,* That no such location shall be made before one year from the passage of this act.

Sec. 3. *And be it further enacted,* That all the expenses of management, superintendence, and taxes from date of selection of said lands, previous to their sales, and all expenses incurred in the management and disbursement of the moneys which may be received therefrom, shall be paid by the States to which they may belong, out of the treasury of said States, so that the entire proceeds of the sale of said lands shall be applied without any diminution whatever to the purposes hereinafter mentioned.

Sec. 4. *And be it further enacted,* That all moneys derived from the sale of the lands aforesaid by the States to which the lands are apportioned, and from the sales of land scrip hereinbefore provided for, shall be invested in stocks of the United States, or of the States, or some other safe stocks, yielding not less than five per centum upon the par value of said stocks; and that the moneys so invested shall constitute a perpetual fund, the capital of which shall remain forever undiminished (except so far as may be provided in section fifth of this act), and the interest of which shall be inviolably appropriated, by each State which may take and claim the benefit of this act, to the endowment, support, and maintenance of at least one college where the leading object shall be, without excluding other scientific and classical studies, and including military tactics, to teach such branches of learning as are related to agriculture and the mechanic arts, in such manner as the legislatures of the States may respectively prescribe, in order to promote the liberal and practical education of the industrial classes in the several pursuits and professions in life.

Sec. 5. *And be it further enacted,* That the grant of land and land scrip hereby authorized shall be made on the following conditions, to which, as well as to the provisions hereinbefore contained, the previous assent of the several States shall be signified by legislative acts:

First. If any portion of the fund invested, as provided by the foregoing section, or any portion of the interest thereon, shall, by any action or contingency, be diminished or lost, it shall be replaced by the State to which it belongs, so that the capital of the fund shall remain forever undiminished; and the annual interest shall be regularly applied without diminution to the purposes mentioned in the fourth section of this act, except that a sum, not exceeding ten per centum upon the amount received by any State under the provisions of this act, may be expended for the purchase of lands for sites or experimental farms, whenever authorized by the respective legislatures of said States.

Second. No portion of said fund, nor the interest thereon, shall be applied, directly or indirectly, under any pretense whatever, to the purchase, erection, preservation, or repair of any building or buildings.

Third. Any State which may take and claim the benefit of the provisions of this act shall provide, within five years, at least not less than one college, as described in the fourth section of this act, or the grant to such State shall cease; and said State shall be bound to pay the United States the amount received of any lands previously sold, and that the title to purchasers under the State shall be valid.

Fourth. An annual report shall be made regarding the progress of each college, recording any improvements and experiments made, with their cost and results, and such other matters, including State industrial and economical statistics, as may be supposed useful; one copy of which shall be transmitted by mail free, by each, to all the other colleges which may be endowed under the provisions of this act, and also one copy to the Secretary of the Interior.

Fifth. When lands shall be selected from those which have been raised to double the minimum price, in consequence of railroad grants, they shall be computed to the States at the maximum price, and the number of acres proportionally diminished.

Sixth. No State while in a condition of rebellion or insurrection against the government of the United States shall be entitled to the benefit of this act.

Seventh. No State shall be entitled to the benefits of this act unless it shall express its acceptance thereof by its legislature within two years from the date of its approval by the President.

Sec. 6. *And be it further enacted,* That land scrip issued under the provisions of this act shall not be subject to location until after the first day of January, one thousand eight hundred and sixty-three.

Sec. 7. *And be it further enacted,* That the land officers shall receive the same fees for locating land scrip issued under the provisions of this act as is now allowed for the location of military bounty land warrants under existing laws; *Provided,* their maximum compensation shall not be thereby increased.

Sec. 8. *And be it further enacted,* That the Governors of the several States to which scrip shall be issued under this act shall be required to report annually to Congress all sales made of such scrip until the whole shall be disposed of, the amount received for the same, and what appropriation has been made of the proceeds.

The supplementary Act of 1866, extending the time within which agricultural colleges may be established, provides among other things that "when any Territory shall become a State and be admitted into the Union, such new State shall be entitled to the benefits of the said Act of July second, eighteen hundred and sixty-two, by expressing the acceptance therein required within three years from the date of its admission into the Union, and providing the college or colleges within five years after such acceptance." It follows therefore that Territories receive only the benefits of the second Morrill Act and the Nelson Amendment, but as soon as they have been admitted to the Union and an allotment has been made they receive the benefits of the Act of 1862.

The Agricultural and Mechanical College of Oklahoma, however, has not become a beneficiary of the Land-Grant Act. In lieu thereof, provision was made in the enabling act for Oklahoma setting aside 250,000 acres for the benefit of the college, and this land has been selected and filed upon.

The Congressional Industrial Fund, or Second Morrill Act.

Approved by President Harrison, August 30, 1890.

An act to apply a portion of the proceeds of the public lands to the more complete endowment and support of the colleges for the benefit of agriculture and the mechanic arts established under the provisions of an act of Congress approved July second, eighteen hundred and sixty-two.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That there shall be, and hereby is, annually appropriated, out of any money in the Treasury not otherwise appropriated, arising from the sales of public lands, to be paid as hereinafter provided, to each State and Territory for the more complete endowment and maintenance of colleges for the benefit of agriculture and the mechanic arts now established, or which may be hereafter established, in accordance with an act of Congress approved July second, eighteen hundred and sixty-two, the sum of fifteen thousand dollars for the year ending June thirtieth, eighteen hundred and ninety, and an annual increase of the amount of such appropriation thereafter for ten years by an additional sum of one thousand dollars over the preceding year, and the annual amount to be paid thereafter to each State and Territory shall be twenty-five thousand dollars to be applied only to instruction in agriculture, the mechanic arts, the English language and the various branches of mathematical, physical, natural and economic science, with special reference to their applications in the industries of life, and to the facilities for such instruction: *Provided*, That no money shall be paid out under this act to any State or Territory for the support and maintenance of a college where a distinction of race or color is made in the admission of students, but the establishment and maintenance of such colleges separately for white and colored students shall be held to be a compliance with the provisions of this act if the funds received in such State or Territory be equitably divided as hereinafter set forth: *Provided*, That in any State in which there has been one college established in pursuance of the act of July second, eighteen hundred and sixty-two, and also in which an educational institution of like character has been established, or may be hereafter established, and is now aided by such State from its own revenue, for the education of colored students in agriculture and the mechanic arts, however named or styled, or whether or not it has received money heretofore under the act to which this act is an amendment, the legislature of such State may propose and report to the Secretary of the Interior a just and equitable division of the fund to be received under this act between one college for white students and one institution for colored students established as aforesaid, which shall be divided into two parts and paid accordingly, and thereupon such institution for colored students shall be entitled to the benefits of this act and subject to its provisions, as much as it would have been if it had been included under the act of eighteen hundred and sixty-two, and the fulfillment of the foregoing provisions shall be taken as a compliance with the provision in reference to separate colleges for white and colored students.

Sec. 2. That the sums hereby appropriated to the States and Territories for the further endowment and support of colleges shall be annually paid on or before the thirty-first day of July of each year, by the Secretary of the Treasury, upon the warrant of the Secretary of the Interior, out of the Treasury of the United States, to the State or Territorial treasurer, or to such officer as shall be designated by the laws of such State or Territory to receive the same, who shall, upon the order of the trustees of the college, or the institution for colored students, immediately pay over said sums to the treasurers of the respective colleges or other institutions entitled to receive the same, and such treasurers shall be required to report to the Secretary of Agriculture and to the Secretary of the Interior, on or before the first day of September of each year, a detailed statement of the amount so received and of its disbursement. The grants of moneys authorized by this act are made subject to the legislative assent of the several States and Territories to the purpose of said grants: *Provided*, That payments of such installments of the appropriation herein made as shall become due to any State before the adjournment of the regular session of legislature meeting next after the passage of this act shall be made upon the assent of the governor thereof, duly certified to the Secretary of the Treasury.

Sec. 3. That if any portion of the moneys received by the designated officer of the State or Territory for the further and more complete endowment, support, and maintenance of colleges, or of institutions for colored students, as provided in this act, shall, by any action or contingency, be diminished or lost, or be misapplied, it shall be replaced by the State or Territory to which it belongs, and until so replaced no subsequent appropriation shall be apportioned or paid to such State or Territory; and no portion of said moneys shall be applied, directly or indirectly, under any pretense whatever, to the purchase, erection, preservation, or repair of any building or buildings. An annual report by the president of each of said colleges shall be made to the Secretary of Agriculture, as well as to the Secretary of the Interior, regarding the condition and progress of each college, including statistical information in relation to its receipts and expenditures, its library, the number of its students and professors, and also as to any improvements and experiments made under the direction of any experiment stations attached to said colleges, with their cost and results, and such other industrial and economical statistics as may be regarded as useful, one copy of which shall be transmitted by mail free to all other colleges further endowed under this act.

Sec. 4. That on or before the first day of July in each year, after the passage of this act, the Secretary of the Interior shall ascertain and certify to the Secretary of the Treasury as to each State and Territory whether it is entitled to receive its share of the annual appropriation for colleges, or of institutions for colored students, under this act, and the amount which thereupon each is entitled, respectively, to receive. If the Secretary of the Interior shall withhold a certificate from any State or Territory of its appropriation the facts and reasons therefor shall be reported to the President, and the amount involved shall be kept separate in the Treasury until the close of the next Congress, in order that the State or Territory may, if it should so desire, appeal to Congress from the determination of the Secretary of the Interior. If the next Congress shall not direct such sum to be paid it shall be covered into the Treasury. And the Secretary of the Interior is hereby charged with the proper administration of this law.

Sec. 5. That the Secretary of the Interior shall annually report to Congress the disbursements which have been made in all the States and Territories, and also whether the appropriation of any State or Territory has been withheld, and if so, the reasons therefor.

Sec. 6. Congress may at any time amend, suspend, or repeal any or all of the provisions of this act.

Nelson Amendment, or Third Endowment Act.

The following clause was inserted in the Act making appropriations for the United States Department of Agriculture, for the year ending June 30, 1908 (Act approved March 14, 1907):

. . . That there shall be, and hereby is, annually appropriated, out of any money in the Treasury not otherwise appropriated, to be paid as hereinafter provided to each State and Territory for the more complete endowment and maintenance of agricultural colleges now established, or which may hereafter be established, in accordance with the act of Congress approved July second, eighteen hundred and sixty-two, and the act of Congress approved August thirtieth, eighteen hundred and ninety, the sum of five thousand dollars, in addition to the sums named in the said act, for the fiscal year ending June thirtieth, nineteen hundred and eight, and an annual increase of the amount of such appropriation thereafter for four years by an additional sum of five thousand dollars over the preceding year, and the annual sum to be paid thereafter to each State and Territory shall be fifty thousand dollars, to be applied only for the purposes of the agricultural colleges as defined and limited in the act of Congress approved July second, eighteen hundred and sixty-two, and the act of Congress approved August thirtieth, eighteen hundred and ninety.

That the sum hereby appropriated to the States and Territories for the further endowment and support of the colleges shall be paid by, to, and in the manner prescribed by the act of Congress approved August thirtieth, eighteen hundred and ninety, entitled "An act to apply a portion of the proceeds of the public lands to the more complete endowment and support of the colleges for the benefit of agriculture and the mechanic arts established under the provisions of the act of Congress approved July second, eighteen hundred and sixty-two," and the expenditure of the said money shall be governed in all respects by the provisions of the said act of Congress approved July second, eighteen hundred and sixty-two, and the said act of Congress approved August thirtieth, eighteen hundred and ninety: *Provided*, That said colleges may use a portion of this money for providing courses for the special preparation of instructors for teaching the elements of agriculture and the mechanic arts.

Mr. Morrill. (By J. E. Goodrich.)

Justin Smith Morrill was born in Strafford, Vt., April 14, 1810, the eldest of ten children. His father, his grandfather, and one of his brothers were blacksmiths. The family came to Vermont in 1798, from Chichester, N. H. The education obtained in the district school was supplemented by a term or two at Thetford Academy, taken in his fourteenth year. Two years as clerk in a country store, and four years in a like position in Portland, Me., constituted his advanced course. Then he was a merchant in Strafford, in partnership with Judge Harris, for fifteen years, at the expiration of which time both partners were satisfied to retire from business. The next seven years he spent in farming a piece of land that he bought upon leaving trade, keeping up, also, his life-long practice of spending his leisure hours with good books. His collection did not include works of fiction, but had room for Blackstone's Commentaries. He also made a special study of the philosophy and various methods of taxation, but kept aloof from politics. He was once made justice of the peace, but did not serve. In 1854 his friends presented his name for the place in Congress made vacant by the resignation of Andrew Tracy, of Woodstock. He was elected by a small majority (a bolting candidate having drawn off some votes), took his seat in the House, December 4, 1855, and received the united support of his party in five successive reëlections.

Fig. 114. Justin S. Morrill.

His maiden speech in the House was presented in June, 1856: a candid and vigorous yet conciliatory argument for the admission of Kansas as a free state. In 1857, he spoke and voted against the bill for further reduction of the low duties laid by the Walker tariff of 1846. The passage of this bill was speedily followed by general financial and industrial disaster. Four years later the merchant-farmer from Vermont was gratified by the passage of what was thereafter known as the Morrill tariff of 1861, a measure reported by him from the Committee of Ways and Means, and carried through the House by his able advocacy. This measure it was, which, supplemented by additional acts, by a system of direct taxation, and by loans —all of which came from Mr. Morrill's committee— kept the treasury in funds during the Civil war, and, after its close, made possible the steady repayment of the enormous debt then incurred. This bill was the first in tariff legislation to impose specific and *ad valorem* duties on the same article; a feature which, by combining the main principles of the two opposing views, reconciled their advocates, and has since characterized all our protective-tariff legislation. This measure, with amendments, remained in force till the passage of the McKinley bill of the fifty-first Congress.

As early as the thirty-sixth Congress, Mr. Morrill secured the passage in both houses of a Land-Grant College Act. Though vetoed by President Buchanan, it was reintroduced in 1862 and, by Mr. Morrill's skilful handling, was again carried through the two Houses and received the signature of President Lincoln. This made possible the founding, in the different states and territories, before his death, of sixty-four colleges specially devoted to "such branches of learning as are related to agriculture and the mechanic arts, without excluding other scientific and classical studies." His own limited schooling seems to have suggested this grand purpose to put the opportunity to pursue advanced studies within the reach of greater numbers, and, at the same time, to secure a more general application of the physical sciences to agriculture and other industrial pursuits. Mr. Morrill was the author, also, of the bill approved August 30, 1890, for the more complete endowment of these colleges. In 1862, he introduced, and secured the passage of the first antipolygamy measure enacted by Congress.

Mr. Morrill took his seat in the Senate March 4, 1867. He was assigned to the committees on Finance (chairman in 1877), on Public Buildings and Grounds, on Education and Labor, and the joint committee on Reconstruction and Revolutionary Claims. The offer of a seat in the cabinet of President Hayes was declined. He was largely instrumental in the erection of many of the beautiful buildings that adorn the national capital, his crowning effort being the creation of the grandest work of art in Washington, the Congressional Library. His last speech in the Senate was in advocacy of the new edifice for the Supreme Court. He is said to have made over one hundred speeches on the floor of Congress. These always conciliated attention by a racy humor, and were given in a clear, vigorous, yet simple English style. He was logical and convincing in argument, but never wasted time in mere debate. To Vermont and to the nation at large he was the "grand old man" among the statesmen of his day.

In 1851 he married Miss Ruth Swan, a Massachusetts woman of cultivation and refinement, whose gracious and homelike hospitality admirably suited with the unostentatious life of her husband. His only publication, aside from his speeches, is a volume issued in 1886, with the title "Self-Consciousness of Noted Persons," mostly culled from his wide and varied reading. His term of continuous service in the national legislature exceeded that of all his contemporaries. The Land-Grant colleges are witnesses to his sagacious forecast and practical spirit. The health and vigor of his later years testify to the simplicity and temperance which characterized his entire life. During his long career as legislator there was no hint of charges of corruption or incapacity. Dartmouth College complimented him with the honorary degree of Master of Arts in 1857; the University of Vermont made him Doctor of Laws in 1874, and the University of Pennsylvania gave the same degree in 1884.

VII. The Land-Grant Colleges

It follows, from these enactments, that every state and territory has an agricultural college deriving support from the Land-Grant Act of 1862 or the Act of 1890, or both. This makes, at the present time, a series of forty-nine institutions endowed by Congress to teach agriculture and the mechanic arts. In most cases, the state also makes appropriations for the agricultural work. Of these establishments, twenty-three are departments of, or colleges connected with, State Universities or other similar or comparable general institutions, and twenty-six are either wholly separate or are parts of technical or industrial institutions. But one of them is only a college of agriculture: this is the Massachusetts College of Agriculture; in that state the Land-Grant fund is divided, the mechanic arts part going to the Institute of Technology. In all the other separate institutions, mechanic arts is associated with agriculture; and the institution may be divided into coördinate departments representing such groups as agriculture, mechanical engineering, civil engineering, architecture, veterinary, home economics, besides the regular arts and science groups.

The lands did not produce the endowments that were expected of them. The government price of public lands in 1862 was $1.25 per acre. But states not having public lands within their own borders and therefore receiving land scrip under the Act of Congress of July 2, 1862, were required, by the second section of that Act, to sell their scrip ("said scrip to be sold by said states"). These forced sales of large amounts of land scrip caused a decline in the price of public lands, which fell below fifty cents an acre. Ezra Cornell (page 394),

Fig. 115. Ezra Cornell.

(1807–1874), in New York, foresaw the shrinkage of these great endowments, and by agreement with the state in 1866 he purchased the lands remaining unsold in order that he might hold them till land values should rise; and he provided that the profits should be funded "as a donation from Ezra Cornell to Cornell University" and the income thereof to be used "for the general purposes of said institution." This provided a general endowment for Cornell University, which had been chartered in 1865. Senator Morrill remarked that "only one college had a Cornell to husband its resources."

The following display shows the number of acres of land received by each state from the Land-Grant, the date of establishment of the institution that cares for the agricultural work, and the date at which instruction in agriculture was begun:

State	Name of institution	Number of acres	Date of establishment	Date of organizing instruction in agriculture
Alabama	Alabama Polytechnic Institute	240,000	1872	1872
Arizona	University of Arizona		1891	1907
Arkansas	University of Arkansas	150,000	1872	
California	University of California	150,000	1868	1868
Colorado	State Agricultural College of Colorado	90,000	1877	
Connecticut	Connecticut Agricultural College	180,000	1881	Sept. 28, 1881, in Storrs Agricultural School
Delaware	Delaware College	90,000	1870	1870
Florida	University of the State of Florida	90,000	1884	1884 in the old Florida Agricultural School
Georgia	Georgia State College of Agriculture and Mechanic Arts (at University of Georgia)	270,000	1872	1854
Idaho	College of Agriculture of the University of Idaho	90,000	1892	Oct. 12, 1892
Illinois	College of Agriculture of the University of Illinois	480,000	1867	1868
Indiana	School of Agriculture of Purdue University	390,000	1874	September, 1879
Iowa	Iowa State College of Agriculture and Mechanic Arts	204,000	1869	October 21, 1868
Kansas	Kansas State Agricultural College	82,313	1863	1863
Kentucky	Agricultural and Mechanical College of Kentucky	330,000	1865	1866
Louisiana	Louisiana State University and Agricultural and Mechanical College	210,000	1874; 1877	1877
Maine	University of Maine	210,000	1865	1868
Maryland	Maryland Agricultural College	210,000	1859	1859
Massachusetts	Massachusetts Agricultural College	360,000	1867	October 2, 1867
Michigan	Michigan State Agricultural College	235,673	1855	May 13, 1857
Minnesota	College of Agriculture of the University of Minnesota	94,000	1869	1869
Mississippi	Mississippi Agricultural and Mechanical College	207,920	1880	1880
Missouri	College of Agriculture and Mechanic Arts of the University of Missouri	277,016	1870	1870
Montana	Montana Agricultural College	90,000	1893	1893
Nebraska	Industrial College of the University of Nebraska	90,000	1869	1871
Nevada	College of Agriculture of the University of Nevada	90,000	1873	1888
New Hampshire	New Hampshire College of Agriculture and the Mechanic Arts	150,000	1866	1868
New Jersey	Rutgers Scientific School, the New Jersey College for the Benefit of Agriculture and the Mechanic Arts	210,000	1864	1864
New Mexico	New Mexico College of Agriculture and Mechanic Arts		1889	1890
New York	New York State College of Agriculture at Cornell University	989,920	1865	1868
North Carolina	North Carolina College of Agriculture and Mechanic Arts	270,000	1889	1889
North Dakota	North Dakota Agricultural College	130,000	1890	January, 1891
Ohio	The College of Agriculture and Domestic Science and of Veterinary Medicine, Ohio State University	630,000	1870	
Oklahoma	Oklahoma Agricultural and Mechanical College	See p. 413	1891	
Oregon	Oregon State Agricultural College	90,000	1868	
Pennsylvania	Pennsylvania State College	780,000	1855	

State	Name of institution	Number of acres	Date of establishment	Date of organizing instruction in agriculture
Rhode Island	Rhode Island College of Agriculture and Mechanic Arts	120,000	1888	1890
South Carolina	Clemson Agricultural College of South Carolina	180,000	1889	
South Dakota	South Dakota Agricultural College	160,000	1881	1884
Tennessee	State Agricultural and Mechanical College of the University of Tennessee	300,000	1794	1869–70
Texas	Agricultural and Mechanical College of Texas	180,000	1871	1876
Utah	Agricultural College of Utah	200,000	1888	1888
Vermont	University of Vermont and State Agricultural College	150,000	1865	1889
Virginia	Virginia Agricultural and Mechanical College and Polytechnic Institute	300,000	1872	1872
Washington	The State College of Washington	90,000	1892	January 14, 1892
West Virginia	West Virginia University	150,000	1867	1867
Wisconsin	College of Agriculture of the University of Wisconsin	240,000	1848	1868
Wyoming	College of Agriculture of the University of Wyoming	90,000	1887	

The Act of 1890 provides for the division of the funds between colleges for white students and colored students. Separate Land-Grant colleges for colored students are established in the following places: Alabama, at Normal; Arkansas, at Pine Bluff; Delaware, at Dover; Florida, Tallahassee; Georgia, Savannah; Kentucky, Frankfort; Louisiana, New Orleans; Maryland, Princess Anne; Mississippi, Alcorn; Missouri, Jefferson City; North Carolina, Greensboro; Oklahoma, Langston; South Carolina, Orangeburg; Texas, Prairie View; Virginia, Hampton; West Virginia, Institute.

VIII. Agricultural Colleges and Schools in Canada

There are four colleges of agriculture in Canada, three supported by the provinces in which they are located and one supported by private beneficence. These are the Ontario Agricultural College, at Guelph, the Nova Scotia Agricultural College, at Truro, the Manitoba Agricultural College, at Winnipeg, and the Macdonald College, at Sainte Anne de Bellevue, Quebec. There are also three agricultural schools in the province of Quebec.

There is no support of agricultural colleges by the Dominion of Canada. The state or provincial institutions are wholly separate from each other, being supported by their respective provinces.

In British Columbia, the Minister of Finance and Agriculture has control over agricultural schools (page 339), but no such schools or colleges have yet been organized, though the question is now under consideration. The government of the province has passed legislation looking to the establishing of a provincial university, and it is proposed to have a chair of agriculture in it.

Ontario.

The earliest movement in Ontario for agricultural education, as in the United States, was through the system of agricultural societies. Immediately following the assembly of the first parliament in Upper Canada, the governor called together certain farmers in the vicinity and formed an agricultural society (October 27, 1792). There is a letter in existence from George Washington that was read at this original society at Niagara, in which he discusses agricultural matters generally.

The agitation for agricultural education began to concrete itself about 1840 to 1850. The Canadian Agricultural Reader, 1845, and Professor Hind's text-book, 1850, were the early expressions of the movement (page 383). About 1860, Egerton Ryerson, Superintendent of Education, advised the teaching of agriculture in at least some of the schools. He later prepared a textbook of agriculture (page 384). A professorship of agriculture was established at the University of Toronto in 1852.

The first definite steps toward the founding of an agricultural college for the province were taken by Hon. John Carling, of London, Ontario, in 1869, when he was Commissioner of Agriculture and Arts. In his report to Governor Howland in that year, he said: "I have a growing conviction that something more is required to give our education a more practical character, especially in reference to the agricultural and mechanical classes of the community, which comprise the great bulk of the population and constitute the principal means of our wealth and prosperity. What now appears to be especially needed, in addition to the ordinary instruction in common schools, is the introduction of elementary instruction in what may be termed the foundation principles of agricultural and mechanical science, and I hope to be able, in the next report I may have the honor of presenting to Your Excellency, to record the fact of a commencement being made with a prospect of success."

On August 12, 1869, Mr. Carling appointed the Rev. W. F. Clarke, of Guelph, a commissioner to visit the principal agricultural colleges of the United States, gain what information he could and report with the view of establishing in the Province a school to give instruction in agriculture and kindred subjects, and to conduct experiments for the purpose of solving some of the problems which confronted those who were engaged in agricultural and horticultural pursuits. Mr. Clarke's report appeared on June 8, 1870. It furnished the Minister with the desired information, and indicated in outline the scope and character of a school of agriculture such as it was thought should be established in the Province of Ontario.

In pursuance of his previous intimation, Mr. Carling, in his report for 1870, definitely proposed the establishment of two schools, one for agriculture and the other for mechanic arts; and the outcome of his recommendation and subsequent action was the founding of the School of Practical Science in Toronto, and the purchase of 600 acres of land for a School of Agriculture at Mimico, seven miles west of Toronto.

The land was purchased in 1871, and a contract for the erection of school buildings for the accommodation of 100 resident pupils at a cost of $47,900 was entered into in November of that year; but a change of government having taken place that fall, the work was delayed for a time, and objections urged against the Mimico site by prominent farmers and stockmen caused some hesitation as to what should be done.

At length, the Hon. Archibald McKellar, the new Commissioner of Agriculture, requested the Provincial Board of Agriculture and Arts, and afterward Professor Miles and Dr. Kedzie of the Michigan Agricultural College, to examine the site and report as to its suitability for an experimental farm.

Both reports were unfavorable to the site, chiefly because of the character of the soil and the lack of church and other privileges, such as are enjoyed in the immediate neighborhood of a town or city; and the result was that a committee was appointed to examine farms in the neighborhood of Whitby, Guelph and Woodstock. This committee reported the facts, without a definite recommendation, on December 13, 1872, and left it for the government to decide, which it did by purchasing the Guelph farm of 550 acres in the early part of 1873. Some additions were made as soon as possible to the farmhouse, which still constitutes the first two stories of the main building, in order to make ready for thirty pupils at as early a date as practicable.

The name decided on was the Ontario School of Agriculture and Experimental Farm. In accordance with the recommendation of a commission appointed to prepare by-laws and regulations for the school, the first years were to be regarded as a preparatory term, in which student help was to be largely employed to put the farm and horticultural department into shape for practical instruction at a later date. During this period, students were to work seven hours a day in the outside departments, and for his labor in these departments each was to receive instruction, lodging, board and washing, with a bonus of fifty dollars in cash at the end of the year, in case he completed it satisfactorily and passed the prescribed examinations on the course of instruction.

On July 29, 1873, Henry McCandless, from Cornell University (from the institution at Glasnevin, Ireland), was appointed the first principal; and on March 26, 1874, there appeared over his signature a long advertisement announcing the opening of the school on May 1, 1874. Following is the list of officers at opening: H. McCandless, from Cornell University, principal; Rev. W. F. Clarke, from Guelph, rector; James McNair, from Richmond Hill, farm foreman; James Stirton, from Guelph, stockman; Thomas Farnham, from Toronto, gardener; James McIntosh, from Guelph, foreman carpenter; Mrs. Petrie, from Guelph, housekeeper; T. Walton, from Toronto, engineer.

Twenty-eight students entered the first term, and the outlook seemed encouraging, but contention arose among the officers. Mr. McCandless resigned on July 18.

Charles Roberts, Esq., of Haslemere, Surrey, England, a prominent graduate of Cirencester Agricultural College, was appointed to succeed Mr. McCandless. He came out for observation in the fall of 1874, but he could not enter on his duties until April, 1875. In the meantime, Wm. Johnston, B.A., of Toronto, who had been appointed rector, discharged the duties of principal. According to agreement, Principal Roberts was on hand in April, 1875, but he was suddenly seized with an illness so severe that he decided to resign his position and return.

William Johnston was employed in the capacity of rector from August, 1874, till the end of 1875, and as principal for nearly four years—from the beginning of 1876 till October 1, 1879. He soon grasped the situation, and placed the institution on a fairly solid foundation.

At the time of Mr. Johnston's resignation, and at his suggestion, the Ontario School of Agriculture and Experimental Farm became the Ontario Agricultural College and Experimental Farm, and the chief executive officer of the institution was afterward to be known as president of the college. His successor was James Mills, who took charge October 1, 1879, and the college then began its uninterrupted career of progress.

The funds of the college come every year by annual vote directly from the legislature of the Province of Ontario. There is no endowment. On two occasions, the college has received gifts in the form of buildings, but no gifts have ever been made for maintenance. The degree is that of Bachelor of the Science of Agriculture, given from the University of Toronto.

On October 12, 1908, the Ontario Veterinary College was formally opened as a branch of the Ontario Department of Agriculture, the government having taken over the institution during the summer. It will now be conducted on plans similar to those of the Ontario Agricultural College.

Nova Scotia.

The Nova Scotia Agricultural College at Truro serves the maritime provinces, to the students from which there is no tuition.

A series of letters on agriculture appeared in one of the Halifax papers over the pseudonym "Agricola," which aroused wide-spread interest. The author, John Young, was not discoverable for a long time. These letters were published in a volume of 462 pages, in 1822.

The next important event seems to have come with the appointment of the late Sir John William Dawson, Superintendent of Education in 1850. He afterward became an eminent scientific leader, as head of McGill University. He was the first superintendent of education of Nova Scotia, and even then laid much stress on the teaching of agriculture. Among his publications are several texts on agriculture and natural history, for use in the schools as well as on the farm (pages 384, 385). He left Nova Scotia about 1853, to take charge of McGill University, and was succeeded in 1855 by Rev. Alexander Forrester, who also was principal of the Provincial Normal School, then opened at Truro for the first time. Dr. Forrester planned to have a farm in connection with the training school, but the land bought for this purpose was given up some time later for sites for the public schools of the town, for railway station accommodation and for general building purposes.

In 1884, under Dr. D. Allison, at that time superintendent of education for Nova Scotia (now President of Mt. Allison University, Sackville, N. B.), a thorough course in the natural sciences, agricultural chemistry and agriculture was established in the normal and secondary schools. He also established, with the coöperation of the Agricultural Department under Dr. George Lawson, the Provincial School of Agriculture, and local agricultural schools conducted by graduates of the School of Agriculture. These graduates now occupy many of the leading positions in the schools of Nova Scotia. In 1885, the nucleus of the present provincial farm was bought, and the Nova Scotia School of Agriculture built, nearly a mile away from the normal school, which was in the center of the town. The two institutions worked together in affiliation, normal school classes being taught the greater part of their science work in the Agricultural building. This continued until March 21, 1898, when the School of Agriculture was accidentally burned. The agricultural teaching department was then accommodated in rented rooms in the town, until, in 1901, the Science building of the Provincial Normal School was completed. For the next few years, the School of Agriculture had its teaching headquarters in this Science building, and the government aided the Nova Scotia School of Horticulture, which was started by the Fruit Growers' Association at Wolfville, in the Annapolis valley. In 1904, Melville Cumming was appointed Principal and Secretary of Agriculture, and the Nova Scotia School of Agriculture and the Nova Scotia School of Horticulture were consolidated in the present building, at Truro, completed in 1905, to accommodate the Nova Scotia Agricultural College. The College was established at Truro expressly because it was thought to be desirable to have it affiliated with the Normal School, so as to give a scientific and industrial training to the teachers who attended for professional work, after obtaining their general education previously in the provincial high schools.

In 1908, a vacation, or summer school, in July and August, under the auspices of the affiliated institutions, was begun for the benefit of teachers employed during the regular school year. One of the courses leads directly to the special reward known as the "Rural Science" diploma, which qualifies a teacher having a standard school-garden to draw an extra grant from the provincial treasury, while the trustees draw an extra grant from the municipal fund.

Under the Provincial Department of Agriculture (page 340), experimental orchards are set out in perhaps every county. Agricultural societies are organized all over the country, and rural courses in practical dairying are given every season in some part of the province. There are short courses of a few weeks in special subjects given in the College of Agriculture, as well as the regular college courses and the courses given to normal school students.

The School of Horticulture at Wolfville, mentioned above, was established in 1893, by the Nova Scotia Fruit Growers' Association, under a grant of $2,000, or fifty dollars per capita, up to forty students who attended the school for the whole term. Its establishment was in response to much agitation on the part of the men of the association, who felt that the Provincial School of Agriculture at Truro, which had been established some ten years, was not of direct benefit to fruit-growers in Annapolis valley, as Truro is entirely outside of the fruit-belt. They therefore secured this appropriation from the provincial treasury, and maintained the school under the direction of a board elected from among the members of the association up to 1904, when the Agricultural College was established at Truro, by combining the former schools of agriculture and horticulture. A small experimental orchard still remains at Wolfville. An experiment station is now to be located in the Annapolis valley.

Prince Edward Island.

In the province of Prince Edward Island, there is no separate school or college of agriculture, but there is a professorship of agriculture in Prince of Wales College, at Charlottetown (page 32, Vol. I). The present constitution of this professorship is as follows (an Act for the Encouragement of Agriculture, as amended to 1906):

"The Lieutenant-Governor in Council shall appoint an officer to be styled the Professor of Agriculture, who shall receive such salary as may be fixed by an Order in Council. He shall give instructions in Scientific Agriculture to students in the Prince of Wales College, and shall lecture to Associations of Farmers and Societies of agricultural subjects. He shall also act as Superintendent of Societies, as Secretary to the Department, and perform generally such other duties as may be assigned to him by the Commissioner."

"The Professor, at the close of each year, shall make a full report in writing to the Commissioner for the information of the Government, showing in detail how the farm has been managed, the results of any experiments conducted for publication, the condition of the Stock, the distribution of the increase or surplus thereof, and all other information necessary for a proper understanding of the manner in which the Farm has been managed during the year."

The Macdonald movement.

James W. Robertson, Commissioner of Agriculture and Dairying for the Dominion of Canada (1890–1894), and before that time one of the staff of the Ontario Agricultural College, saw the inadequacy of present methods of education in rural communities. By means of lectures, literature and personal persuasion, he aroused a wide-spread interest in agricultural subjects, always with great emphasis on the educational side. Sir William Macdonald, a public-spirited capitalist of Montreal, and well known for his sympathetic interest in the problems of the people, was attracted by Mr. Robertson's work and ideals, and offered to aid him with financial support. The result has been the evolution of "The Macdonald Movement" in Canada, in the last ten years. The general plan, at first, was to start off educational enterprises in various localities, and to maintain them until the people saw their value; thereafter, the enterprises were to be left with the communities to maintain. It was an effort to show the way.

Manual training, school-gardens, nature-study, seed-grain competitions, and others, were put under way in chosen centers here and there in the Dominion. About a dozen selected and trained teachers were sent to the United States to fit themselves for community work in the new education. The support of these local enterprises, which was extensive at one time, is now largely withdrawn, and the people are beginning to maintain the work.

In 1903, Sir William founded the Macdonald Institute at Guelph, in connection with the Ontario Agricultural College, "to furnish long and short courses in home economics, nature-study, and manual training,—the last two for teachers, male and female, and the home economics for farmers' daughters and other young women who desire to learn the theory and practice of cooking, ventilation, general housekeeping," and the like. This is now one of the recognized institutions of Canada.

The culmination of the movement is the founding of Macdonald College, at Sainte Anne de Bellevue, on the island of Montreal, and which was opened to students in the fall of 1907. This is the only college of agriculture in North America that has sprung at once fully developed out of the combined work and generosity of two men; five millions of dollars have been expended in the lands, buildings, equipments and endowment. The purposes of the institution are stated as follows, in the last announcement.

"Macdonald College, which is incorporated with McGill University, was founded, erected, equipped, and endowed by Sir William C. Macdonald for the following, among other purposes:

"1. For the advancement of education; for the carrying on of research work and investigation and the dissemination of knowledge: all with particular regard to the interests and needs of the population in rural districts.

"2. To provide suitable and effective training for teachers, and especially for those whose work will directly affect the education in schools in rural districts.

"Recognizing the importance of adequate education, adapted to the needs of the rural communities which are the great producing classes of the country, this College will labor in sympathy with all educational effort which makes for the development and increase of intelligence, of power, ability, and skill, and of willingness to coöperate for the common good in each locality, as well as in the nation at large. Therein lies the reason for arranging the work of the College into a School for Teachers, a School of Agriculture, and a School of Household Science. Increase of productiveness, with improvement of products in the field and in the industries of the farm and the town, greater comfort and enjoyment in the home, a better taught school for the children, and a nobler sense of the responsibilities of life—these are some of the advantages which Macdonald College hopes to assist in providing for Canada.

"The College property comprises 561 acres, and has been arranged into four main areas, viz.: (1) The Campus, with lawn, school-garden, and recreation fields for boys and girls; (2) Experimental Grounds, with plots for illustration and research in grains, grasses and flowers; (3) the Small Cultures Farm for horticulture and poultry-keeping; and (4) the Live Stock and Grain Farm extending to 387 acres.

"The College is divided into three schools, and a student is enrolled in that one in which the major portion of his work is taken:

"(1) The School for Teachers, where will be offered a comprehensive and thoroughly practical training in the art and science of teaching.

"(2) The School of Agriculture, which aims to provide a theoretical and practical training in the several branches of Agriculture.

"(3) The School of Household Science, in which young women receive training which will make for the improvement and greater enjoyment of home life."

Agricultural schools in Quebec.

There are three schools in the province of Quebec devoted to agriculture and receiving aid from the provincial legislature.

Oka Agricultural School

In 1880, French vegetarian monks, called Trappists, landed at the Indian village of Oka, which still exists, thirty miles from Montreal, on the bank of the Lake of Two Mountains, where the waters of the Ottawa and the St. Lawrence rivers meet.

These people were good gardeners and fruit-growers, also skilful at raising stock and managing different farm industries. In fact, they were obliged to make their living from the product of their manual labor on the farm. Neighbors were struck with the beauty and the richness of the Trappists' vegetable and fruit cultures, and farmers and farmers' sons asked the privilege to spend one season in the Trappists' gardens, orchards, creameries, apiaries or poultry departments, in order to learn the methods. This was the beginning of the agricultural school, which was officially recognized by the provincial government in 1893. The modest school of agriculture has since become a provincial agricultural institute. conferring the degree and diploma of Bachelor of Agriculture in the agricultural sciences and arts.

The scientific and practical training at the college is given by twelve or fifteen Trappist fathers and lay teachers. The average number of pupils is about seventy-five. Most of the pupils are from the province of Quebec, although the list mentions students from various parts of North and South America, England, Scotland, Ireland, France, Belgium. A striking feature of the institution is that the rough products of the farm are industrialized on the place itself for the general market. Thus, the forest products of the surrounding woods and mountains are converted into timber and furniture in the valley where the institute has its shops and machinery. Vegetables and fruits are canned at the institute or made into jellies, catsups, cider, wine. From the milk of one hundred registered cows is manufactured the noted "Oka cream cheese." The apiary, poultry plants, nurseries and sugar groves are well known even outside of Quebec province.

In August, 1907, a new contract was entered into between the government and the Corporation of Notre-Dame-du-Lac des Deux-Montagnes, the owner of the Oka Agricultural School, with a view to reorganize that institution and to affiliate the same with the Montreal Laval University. That affiliation has taken place, and the institution is now in a position to confer the degree of Bachelor of Agriculture and the diploma of Agronomical Engineer. For that purpose the standard of the studies has been raised, making them more scientific; the number of teachers has been increased, and many improvements have been made in equipment and otherwise. Last year sixty-seven pupils attended the school.

To the school is attached a farm of more than four hundred acres, where the pupils receive practical instruction in arboriculture, fruit-culture, aviculture, apiculture, dairying, vegetable- and fruit-canning. There are orchards of fifty-five to sixty acres, a butter and a cheese factory, an apiary and a canning factory. In a maple bush near the school, syrup and sugar are made every spring by the pupils who wish to become familiar with that industry.

The school receives from the government an annual grant of $5,500, and a monthly grant of seven dollars for every pupil who attends the school, to the number of fifty pupils.

Besides regular students, whose course lasts two and three years, special or short popular courses are given to farmers and others.

Provincial Dairy School at St. Hyacinthe

For many years there has been a dairy school at St. Hyacinthe, but a new building, roomy and modern, and comfortable for the pupils, was erected in 1906. It is under the control of the Minister of Agriculture ot Quebec, who has entrusted the teaching to professors recommended by the Dairymen's Association. No appointment can be made without his consent. A farm of seventy acres is attached, which will be worked with a view of improving and developing the dairy industry of the province.

The institution is in a position to grant diplomas of capacity to butter and cheese manufacturers and to inspectors of butter and cheese factories. No inspector can act without a permit or diploma given by the school. There are 2,806 butter and cheese factories in the province of Quebec. Almost all of these factories are visited during the summer by an inspector. This inspection cost the government $32,427.51 in 1907. In the summer of 1908 the number of inspectors employed was seventy-nine.

The principal professors of the school are the head inspector of the butter factories and the head inspector of the cheese factories. Every year there is a special course for old and new inspectors. The number of students who attended the school in 1907 was 150. It is supported entirely by the provincial government. An appropriation of $5,500 was voted for the support of the school for the year 1908.

The Agricultural School of St. Anne de la Pocatière

The Agricultural School of Sainte Anne de la Pocatière was opened October 10, 1858, by the Corporation of St. Anne de la Pocatière College, whose members are priests. This school receives from the government 1 per cent on an annual grant of $2,500; 2 per cent on a grant of seven dollars a month for pupils above ten in number attending the courses. In 1907 there were thirty-two students in attendance. It grants diplomas. A large farm is attached to the institution.

Manitoba.

The legislature of Manitoba in March, 1903, passed an act establishing an agricultural college. Pursuant to the provisions of the act, an Advisory Board was appointed in April of the succeeding year, and in the following month it made plans for the construction of the buildings. The institution, known as Manitoba Agricultural College, was opened to students November 6, 1906. The college adjoins the western limits of the city of Winnipeg, on the Assiniboine river. The college is affiliated with the University of Manitoba. The course of study leads to the degree of Bachelor of Science in Agriculture.

RISE OF THE EXPERIMENT STATIONS

We have seen that one of the earliest results of the organization of agricultural societies was discussion of experiments for the betterment of agriculture. Various kinds of model farms, test grounds, seed-control stations, and the like, have grown out of the agricultural organizations in various parts of the world. These experiment institutions began to separate themselves out as distinct organizations in Europe about the middle of the past century. The station at Moeckern, near Leipzig, was organized in 1851, and, although this was not the first experiment station, it served as a model for early American institutions. The number of stations of one kind and another in Europe is large, but they are nowhere nationalized as they are in the United States.

While the founding of experiment stations has not appealed to private munificence as colleges have, yet there are a number of privately endowed institutions of this kind. The most notable example in the world is the Rothamsted Agricultural Experiment Station, at Harpenden, England. This was founded by Sir John Bennett Lawes, in 1843, with Dr. J. H. Gilbert as chemist; and the name of Lawes and Gilbert has become known all over the world for long-continuing and accurate research. This station was reorganized in 1889; and its permanence is assured by the Lawes Agricultural Trust Fund.

In 1876 a private experiment station was established at Houghton Farm, in Orange county, N. Y., by Mr. Lawson Valentine, a merchant of New York City. Mr. Valentine engaged the best talent that could be secured, and the reports from the Farm at once took high place in the current agricultural literature. This institution continued until Mr. Valentine's death, in 1888, but before that time the work of the institution had been paralleled by the various state experiment stations.

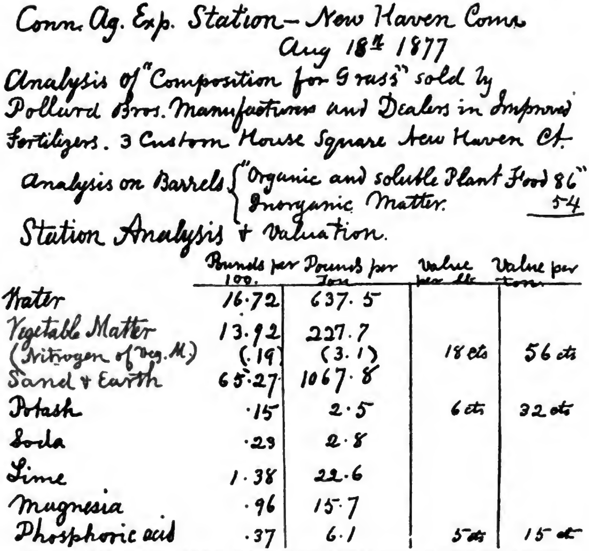
I. The Experiment Station Movement in the United States

In the United States and Canada the agitation for tests and experiments arose out of many agricultural organizations. Professorships of agricultural chemistry early became attached to various institutions or were established as separate chairs in some of the states; and a good part of the work of these professors was expected to be the making of experiments in the field. Investigation was a part of all the early schools or colleges of agriculture. A joint resolution of the New York legislature, April, 1849 (page 391), provided for a commission to perfect plans for an agricultural college and "experimental farm." When the chain of agricultural colleges was established, the experimental work received a marked impetus. These institutions found a new and untried field and they at once began to discover and develop their subject-matter as well as to teach. The results of these experiments were published in the journals of the time, the proceedings of societies, and sometimes in official state reports. The early reports of the Michigan Board of Agriculture, for example, contain the results of many important investigations. The work of Johnson and his associates in Connecticut, Cook in New Jersey, Pugh in Pennsylvania, Kedzie, Beal and others in Michigan, Stockbridge and Goessmann in Massachusetts, Hilgard in Mississippi and California, and many others, was notable long before regular experiment stations were organized.

The agricultural colleges early realized the importance of investigation as a necessary part of their work, and, as early as ten years after the passage of the Land-Grant Act, these institutions began to agitate, in a convention of delegates, the founding of stations for experiment purposes. One of the very early concrete movements was in Connecticut, in December, 1873, before the State Board of Agriculture, the movement being led by S. W. Johnson and W. O. Atwater. The following winter a bill to establish an experiment station was introduced in the legislature, but it did not pass. Mr. Orange Judd, proprietor and editor of the American Agriculturist and trustee of Wesleyan University, at Middletown, Conn., offered $1,000 to begin the work, and the use of the chemical laboratory in the Orange Judd Hall of Natural Science, in the University, on condition that the state appropriate $2,800 per year, for two years. The legislature made the appropriation in 1875; and scientific work began in October of that year. This was the first experiment station in the United States supported by the state. The late W. O. Atwater was made director. In 1877, the state enlarged the appropriation and took full charge; and the station was thereupon removed to New Haven, where the Land-Grant institution was then established. S. W. Johnson became director, a position that he filled for twenty-three years.

Other experiment stations, or provisions for experimental work, followed rapidly in many states. In 1873, the regents of the University of California established an experiment station or department. E. W. Hilgard was made director of it in 1874, and in 1877 a legislative grant was made specifically for the work. By act of the legislature, approved in March, 1877, the North Carolina Agricultural Experiment Station was established at Chapel Hill, in connection with the State University and as a division of the State Department of Agriculture. Dr. Albert R. Ledoux was made director. In 1887 the station was transferred to the North Carolina College of Agriculture and Mechanic Arts. In 1879, the Cornell University Agricultural Experiment Station, Ithaca, N. Y., was organized by the faculty in agriculture. The agricultural societies of the state were represented in the board of control. Three reports were issued previous to the passage of the national Experiment Station Act, the second of which, on scale insects, is still a standard and original work. In 1880 the legislature of the state of New York took measures to establish an experiment station, which was accomplished in 1882, at Geneva, forty miles from Ithaca.

This institution, which has had an uninterrupted existence, is known as the New York Agricultural Experiment Station. In 1880, a state experiment station was organized in New Jersey, by G. H. Cook. The Ohio Agricultural Experiment Station was organized by legislative enactment in 1882. An experiment station as a part of the University of Tennessee, was organized in 1882. The Massachusetts Agricultural Experiment Station was organized in 1882, receiving state support. The Alabama and Wisconsin stations date from 1883, and the Nebraska from 1884. The legislature of Michigan appropriated funds in 1885, authorizing the Agricultural College to publish bulletins of experimental work. Stations were started in 1885 in Indiana, Kentucky, Maine and Minnesota. In Louisiana a private sugar-planters' experiment station was established in 1885, and a state station in 1886. Vermont and New Hampshire established stations in 1886. This brings us to the period of the nationalizing of the movement.



Conn. Ag. Exp. Station — New Haven Conn.
Aug 18th 1877

Analysis of "Composition for Grass" sold by Pollard Bros. Manufacturers and Dealers in Improved Fertilizers. 3 Custom House Square New Haven Ct.

Analysis on Barrels {"Organic and soluble Plant Food 86"
Inorganic Matter. 54

Station Analysis + Valuation.

	Pounds per 100.	Pounds per Ton	Value per lb	Value per ton
Water	16.72	637.5		
Vegetable Matter	13.92	227.7		
(Nitrogen of Veg. M.)	(.19)	(3.1)	18 cts	56 cts
Sand + Earth	65.27	1067.8		
Potash	.15	2.5	6 cts	32 cts
Soda	.23	2.8		
Lime	1.38	22.6		
Magnesia	.96	15.7		
Phosphoric acid	.37	6.1	5 cts	15 cts

Fig. 116. Facsimile, full size, of half of a bulletin, or circular, issued in 1877, by the Connecticut Agricultural Experiment Station. Shows only part of the table.

The results of the work of the earliest stations were not published in bulletins, but in newspapers, reports of societies and boards, annual reports, in circulars and on sheets or slips of paper. The regular series of uniform and well-illustrated experiment station bulletins came with the founding of the stations on the federal act of 1887. The Connecticut station issued some of its early results on hand-written, mimeographed sheets. Fig. 116 shows one-half of one of these publications, full size.

The increasing interest in experiment and research in agriculture expressed itself more and more in a demand for support by the federal government. This demand culminated in a bill introduced in Congress in 1882 by Hon. C. C. Carpenter, of Iowa. This bill, however, was not put on its passage. In 1884, another bill was introduced by Hon. William Cullen, of Illinois. The convention of the agricultural colleges and experiment stations took very active interest in the support of an experiment station bill, and on January 7, 1886, Hon. William H. Hatch, of Missouri, introduced the bill which, with various modifications, finally became a law by the signature of President Cleveland on March 2, 1887. By the terms of this act, the first really national system of experiment stations in the world came into existence. The act provides for one experiment station in every state, to be located preferably in connection with the Land-Grant college, and to be a part of it. This bill finally completed the conception of an agricultural college as an institution which is to discover truth and also to teach. The station and the college are not located together in Georgia, and the station has a separate board of control (in which, however, the college has a representative); and in Ohio a single station is maintained separately from the Land-Grant college. Connecticut and New York still retain their separate state stations, giving these states the benefit of two experiment institutions; but these stations receive a part of their funds from the federal act. The state station still exists in New Jersey, but it is under the same director, although not under the same control, as the federal station; they are both at New Brunswick (Rutgers College), and one is denominated the New Jersey State Agricultural Experiment Station and the other as the New Jersey Agricultural College Experiment Station. In North Carolina, there are two stations — the North Carolina Agricultural Experiment Station at West Raleigh (mentioned on page 422), and the Agricultural Experiment Station of the North Carolina State Department of Agriculture at Raleigh, authorized by the legislature of 1907; they are separate, with different directors and boards of control. In Alabama, the main station is at Auburn, as a department of the Alabama Polytechnic Institute; and there is a Canebrake Agricultural Experiment Station at Uniontown, and the Tuskegee Agricultural Experiment Station. In Louisiana, there are three stations, now all under one directorate. Missouri has a State Fruit Experiment Station at Mountain Grove, in addition to the federal station in the State University at Columbia. In Pennsylvania, the State College has the regular federal station and an Institute of Animal Nutrition. In all the other states and territories, there is but one station (or only local branches thereof) and this is at the Land-Grant college. Stations are maintained in Alaska, Hawaii, Porto Rico and Guam directly by the United States Department of Agriculture, and in the Philippines by the insular government.

The work of the stations in all the states and territories is supervised by the Office of Experiment Stations of the United States Department of Agriculture. This Office publishes technical abstracts of all experiment station literature in the monthly "Experiment Station Record," and popular abstracts under the serial title "Experiment Station Work." It also publishes bulletins on its own account, many of which are founded on investigations made by the Office.

The Department of Agriculture itself conducts numerous investigations in many parts of the country, on a great range of subjects; and the results are widely spread in bulletins.

All these agencies place at the disposal of the American farmer an unequaled body of reliable, useful and interesting literature.

Experiment Station Act, or Hatch Act. (Approved by President Cleveland, March 2, 1886.)

An Act to establish agricultural experiment stations in connection with the colleges established in the several States under the provisions of an act approved July second, eighteen hundred and sixty-two, and of the acts supplementary thereto.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That in order to aid in acquiring and diffusing among the people of the United States useful and practical information on subjects connected with agriculture, and to promote scientific investigation and experiment respecting the principles and applications of agricultural science, there shall be established under direction of the college or colleges or agricultural department of colleges in each State or Territory established, or which may hereafter be established, in accordance with the provisions of an act approved July second, eighteen hundred and sixty-two, entitled "An act donating public lands to the several States and Territories which may provide colleges for the benefit of agriculture and the mechanic arts," or any of the supplements to said act, a department to be known and designated as an "agricultural experiment station:" *Provided,* that in any State or Territory in which two such colleges have been or may be so established the appropriation hereinafter made to such State or Territory shall be equally divided between such colleges, unless the legislature of such State or Territory shall otherwise direct.

Sec. 2. That it shall be the object and duty of said experiment stations to conduct original researches or verify experiments on the physiology of plants and animals; the diseases to which they are severally subject, with the remedies of the same; the chemical composition of useful plants at their different stages of growth; the comparative advantages of rotative cropping as pursued under the varying series of crops; the capacity of new plants or trees for acclimation; the analysis of soils and water; the chemical composition of manures, natural or artificial, with experiments designed to test their comparative effects on crops of different kinds; the adaptation and value of grasses and forage plants; the composition and digestibility of the different kinds of food for domestic animals; the scientific and economic questions involved in the production of butter and cheese; and such other researches or experiments bearing directly on the agricultural industry of the United States as may in each case be deemed advisable, having due regard to the varying conditions and needs of the respective States and Territories.

Sec. 3. That in order to secure, as far as practicable, uniformity of methods and results in the work of said stations, it shall be the duty of the United States Commissioner (now Secretary) of Agriculture to furnish forms, as far as practicable, for the tabulation of results of investigation or experiments; to indicate, from time to time, such lines of inquiry as to him shall seem most important, and, in general, to furnish such advice and assistance as will best promote the purpose of this act. It shall be the duty of each of said stations annually, on or before the first day of February, to make to the governor of the State or Territory in which it is located a full and detailed report of its operations, including a statement of receipts and expenditures, a copy of which report shall be sent to each of said stations, to the said Commissioner (now Secretary) of Agriculture, and to the Secretary of the Treasury of the United States.

Sec. 4. That bulletins or reports of progress shall be published at said stations at least once in three months, one copy of which shall be sent to each newspaper in the States or Territories in which they are respectively located, and to such individuals actually engaged in farming as may request the same and as far as the means of the station will permit. Such bulletins or reports and the annual reports of said stations shall be transmitted in the mails of the United States free of charge for postage, under such regulations as the Postmaster-General may from time to time prescribe.

Sec. 5. That for the purpose of paying the necessary expenses of conducting investigations and experiments and printing and distributing the results as hereinbefore prescribed, the sum of fifteen thousand dollars per annum is hereby appropriated to each State, to be specially provided for by Congress in the appropriation from year to year, and to each Territory entitled under the provisions of section eight of this act, out of any money in the Treasury proceeding from the sales of public lands, to be paid in equal quarterly payments on the first day of January, April, July, and October in each year, to the treasurer or other officer duly appointed by the governing boards of said colleges to receive the same, the first payment to be made on the first day of October, eighteen hundred and eighty-seven: *Provided, however*, That out of the first annual appropriation so received by any station an amount not exceeding one-fifth may be expended in the erection, enlargement, or repair of a building or buildings necessary for carrying on the work of such station; and thereafter an amount not exceeding five per centum of such annual appropriation may be so expended.

Sec. 6. That whenever it shall appear to the Secretary of the Treasury from the annual statement of receipts and expenditures of any of said stations that a portion of the preceding annual appropriation remains unexpended, such amount shall be deducted from the next succeeding annual appropriation to such station, in order that the amount of money appropriated to any station shall not exceed the amount actually and necessarily required for its maintenance and support.

Sec. 7. That nothing in this act shall be construed to impair or modify the legal relation existing between any of the said colleges and the government of the States or Territories in which they are respectively located.

Sec. 8. That in States having colleges entitled under this section to the benefits of this act and having also agricultural experiment stations established by law separate from said colleges, such States shall be authorized to apply such benefits to experiments at stations so established by such States; and in case any State shall have established, under the provisions of said act of July second aforesaid, an agricultural department or experimental station in connection with any university, college, or institution not distinctively an agricultural college or school, and such State shall have established or shall hereafter establish a separate agricultural college or school, which shall have connected therewith an experimental farm or station, the legislature of such State may apply in whole or in part the appropriation by this act made to such separate agricultural college or school, and no legislature shall by contract, express or implied, disable itself from so doing.

Sec. 9. That the grants of moneys authorized by this act are made subject to the legislative assent of the several States and Territories to the purposes of said grants: *Provided*, That payment of such installments of the appropriation herein made as shall become due to any State before the adjournment of the regular session of its legislature meeting next after the passage of this act shall be made upon the assent of the governor thereof duly certified to the Secretary of the Treasury.

Sec. 10. Nothing in this act shall be held or construed as binding the United States to continue any payments from the Treasury to any or all the States or institutions mentioned in this act, but Congress may at any time amend, suspend, or repeal any or all the provisions of this act.

The Second Experiment Station Act, or Adams Act (Approved by President Roosevelt, March, 16, 1906).

The operations proceeding from state legislation in early days were largely defense work, such as analysis and control of fertilizers, feeding-stuffs, devising ways and means to combat insects and diseases, and general protection against error and fraud. The Hatch fund has been used for administrative expenses, printing, and a large extent of experimental effort ranging from thoroughly scientific work to simplified demonstrations. The necessity of doing a more constructive work gradually forced itself on the stations. Within ten years after their organization by federal law, the stations had become accepted and established institutions, and this in spite of the fact that men had to be trained for new work, and that the demands on them were so various as to divide or even dissipate their energies. The experiment stations are now so necessary to our agriculture that they could not possibly be dislodged. The proper continuance of their work, however, depends on devoting part of their energies to long-continued research on the fundamental problems of agriculture; and the Adams fund provides for this. The text of this law is as follows:

An Act to provide for an increased annual appropriation for agricultural experiment stations and regulating the expenditure thereof.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That there shall be, and hereby is, annually appropriated, out of any money in the Treasury not otherwise appropriated, to be paid as hereinafter provided, to each State and Territory, for the more complete endowment and maintenance of agricultural experiment stations now established or which may hereafter be established in accordance with the act of Congress approved March second, eighteen hundred and eighty-seven, the sum of five thousand dollars in addition to the sum named in said act for the year ending June thirtieth, nineteen hundred and six, and an annual increase of the amount of such appropriation thereafter for five years by an additional sum of two thousand dollars over the preceding year, and the annual amount to be paid thereafter to each State and Territory shall be thirty thousand dollars, to be applied only to paying the necessary expenses of conducting original researches or experiments bearing directly on the agricultural industry of the United States, having due regard to the varying conditions and needs of the respective States or Territories.

Sec. 2. That the sums hereby appropriated to the States and Territories for the further endowment and support of agricultural experiment stations shall be annually paid in equal quarterly payments on the first day of January, April, July, and October of each year by the Secretary of the Treasury, upon the warrant of the Secretary of Agriculture, out of the Treasury of the United States, to the treasurer or other officer duly appointed by the governing boards of said experiment stations to receive the same, and such officers shall be required to report to the Secretary of Agriculture on or before the first day of September of each year a detailed statement of the amount so received and of its disbursement, on schedules prescribed by the Secretary of Agriculture. The grants of money authorized by this act are made subject to legislative assent of

> the several States and Territories to the purpose of said grants: *Provided*, That payment of such installments of the appropriation herein made as shall become due to any State or Territory before the adjournment of the regular session of the legislature meeting next after the passage of this act shall be made upon the assent of the governor thereof, duly certified by the Secretary of the Treasury.
>
> Sec. 3. That if any portion of the moneys received by the designated officer of any State or Territory for the further and more complete endowment, support, and maintenance of agricultural experiment stations as provided in this act shall by any action or contingency be diminished or lost or be misapplied, it shall be replaced by said State or Territory to which it belongs, and until so replaced no subsequent appropriation shall be apportioned or paid to such State or Territory; and no portion of said moneys exceeding five per centum of each annual appropriation shall be applied, directly or indirectly, under any pretense whatever, to the purchase, erection, preservation, or repair of any building or buildings, or to the purchase or rental of land. It shall be the duty of each of said stations annually, on or before the first day of February, to make to the governor of the State or Territory in which it is located a full and detailed report of its operations, including a statement of receipts and expenditures, a copy of which report shall be sent to each of said stations, to the Secretary of Agriculture, and to the Secretary of the Treasury of the United States.
>
> Sec. 4. That on or before the first day of July in each year after the passage of this act the Secretary of Agriculture shall ascertain and certify to the Secretary of the Treasury as to each State and Territory whether it is complying with the provisions of this act and is entitled to receive its share of the annual appropriation for agricultural experiment stations under this act and the amount which thereupon each is entitled, respectively, to receive. If the Secretary of Agriculture shall withhold a certificate from any State or Territory of its appropriation, the facts and reasons therefor shall be reported to the President and the amount involved shall be kept separate in the Treasury until the close of the next Congress in order that the State or Territory may, if it shall so desire, appeal to Congress from the determination of the Secretary of Agriculture. If the next Congress shall not direct such sum to be paid, it shall be covered into the Treasury; and the Secretary of Agriculture is hereby charged with the proper administration of this law.
>
> Sec. 5. That the Secretary of Agriculture shall make an annual report to Congress on the receipts and expenditures and work of the agricultural experiment stations in all of the States and Territories, and also whether the appropriation of any State or Territory has been withheld; and if so, the reason therefor.
>
> Sec. 6. That Congress may at any time amend, suspend, or repeal any or all of the provisions of this act.

A supplementary Act approved June 30, 1906, provided that the Act of March 16, 1906

> Shall be construed to appropriate for each station the sum of five thousand dollars for the fiscal year ending June thirtieth, nineteen hundred and six, the sum of seven thousand dollars for the fiscal year ending June thirtieth, nineteen hundred and seven, the sum of nine thousand dollars for the fiscal year ending June thirtieth, nineteen hundred and eight, the sum of eleven thousand dollars for the fiscal year ending June thirtieth, nineteen hundred and nine, the sum of thirteen thousand dollars for the fiscal year ending June thirtieth, nineteen hundred and ten, and the sum of fifteen thousand dollars for the fiscal year ending June thirtieth, nineteen hundred and eleven. The sum of five thousand dollars appropriated for the fiscal year nineteen hundred and six shall be paid on or before June thirtieth, nineteen hundred and six, and the amounts appropriated for the subsequent years shall be paid as provided in the said act to each State and Territory for the more complete endowment and maintenance of agricultural experiment stations now established or which may hereafter be established in accordance with the act of Congress approved March second, eighteen hundred and eighty-seven.

When the Adams fund shall have matured, the United States government will be appropriating annually about one and one-half millions of dollars for experiment stations. The states are now appropriating more than the federal government to experiment-station work. In three years, therefore, the funds annually available in the United States may be expected to exceed three million dollars. The stations are now issuing about five hundred separate publications each year, with a total circulation exceeding three million copies. The mailing lists are growing rapidly, by spontaneous requests from persons interested in agriculture. The stations in the United States employ about one thousand officers in administration and investigation.

The subjects discussed in these publications cover practically the whole range of agricultural science and practice, and many of the arts related thereto. The publications are emerging from the temporary and fragmentary character of the early days of the station work, and are now regarded not only as invaluable aids to the business of farming, but as dignified and permanent records of the world's knowledge. The editorial make-up of the publications is receiving careful attention in many of the stations,—so much so that a new kind of editorial purpose is arising in this country. Gradually the work is being assembled into books and monographic reports, where the best thought on a given subject may be consulted in a single place. The periodical press, both agricultural and general, makes great use of the experiment-station results, and the ideas that arise from the stations are becoming a matter of common speech, even though the speaker may be unaware of the fact.

Mr. Hatch (Fig. 117).

William Henry Hatch, lawyer, was born in Georgetown, Kentucky, September 11, 1833. He died near Hannibal, Missouri, December 23, 1896. In 1854 he was admitted to the bar. He practiced law in Kentucky and Missouri, in the latter state being circuit attorney for two terms. He was captain and lieutenant-colonel in the Confederate army. He was elected a Representative from Missouri to Congress in 1878, and served continuously for sixteen years. Much of the time he was chairman of the Committee on Agriculture. He was an ardent supporter of all legislation looking to the upbuilding of the Department of Agriculture, and was influential in making the head of the Department of Agriculture a cabinet officer. He rendered good service in establishing the Bureau of Animal Industry; assisted in the passage of the oleomargarine law, and as president of the National Dairy Union after his retirement from the House, led the winning fight in behalf of the filled-cheese law. His greatest service to agriculture, however, was his active leadership in securing the passage of the Experiment Station bill. He zealously espoused the cause of farmers, and possessed the ability as a parliamentarian and influence as a member to compel recognition at critical times.

On December 30, 1896, the New York Mercantile Exchange expressed its appreciation of Mr. Hatch's service to agriculture, in the following resolutions prepared by George A. Boyce, president of the New York branch of the National Dairy Union. They show the esteem in which he was held among men of affairs:

Fig. 117. William H. Hatch.

> Whereas, The members of the New York Mercantile Exchange have learned with profound sorrow and regret of the death of ex-Congressman W. H. Hatch, of Missouri, and late president of the National Dairy Union, and although Mr. Hatch was not a member of our institution, he was well known throughout the dairy world as the friend and champion of pure butter and cheese, and during his political career he was brought in contact with many of our members who were sent to Washington to urge legislation favoring dairy products, and in conferences displayed marked ability, and cheerfully rendered incalculable service to the produce trade; therefore, be it
>
> Resolved, That we place on record this expression of our sorrow, and convey to the afflicted family our sincere sympathy in this their sad bereavement.
>
> Resolved, That a copy of the foregoing be sent to the family of the deceased, and placed on the minutes of the Exchange.

Mr. Adams (Fig. 118).

Henry Cullen Adams, farmer, statesman, was born in Verona, Oneida county, New York, November 28, 1850. He died on July 9, 1906, at the Auditorium Hotel, Chicago, on his way home from the Fifty-ninth Congress. His father was Benjamin Franklin Adams, for some time professor of Greek and Latin in Hamilton College, Clinton, N. Y. While Adams was yet an infant, his parents removed to Wisconsin, living at Beaver Dam, Liberty Prairie, and finally on a farm near Madison. He was reared on the farm, educated in the public schools, in the academy at Albion, and spent three years at the University of Wisconsin, ill health preventing his finishing his course. He was for years of frail physique, yet active, energetic, self-reliant. He undertook to read law in a law office, but was forced to desist, and thereupon engaged in the dairy and fruit business, in which he continued up to the last fifteen years, which, aside from his official duties, he largely devoted to real estate.

The range of Mr. Adams' activities was extended and varied. He was institute conductor; secretary of the State Horticultural Society; president of the State Dairymen's Association; an influential member of the State Board of Agriculture. His political history is equally varied and extensive. He was Assemblyman for two terms; Superintendent of Public Property for six years; Dairy and Food Commissioner for eight years; Congressman in the Fifty-eighth and Fifty-ninth Congresses, as Representative from the Second Congressional District of Wisconsin. He was a Republican, and stood high in his party's councils, serving for years as a member of the State Central Committee. He was once delegate-at-large to the Republican National Convention. His principal committee assignment in Congress was to the Committee on Agriculture. Aside from his efforts to increase the appropriation for the agricultural experiment stations throughout ths country, he was notably influential in the framing and enacting of the meat-inspection act and the pure-food bill. He opposed stoutly the Philippine tariff and the joint statehood bills.

On October 15, 1878, Mr. Adams was married to Anna B. Norton, of Madison, Wis., who survives him. There are four children, two sons and two daughters.

Mr. Adams was as notable in his honesty and fidelity as he was frail in muscular power. His judgment of men and measures was superior. He was industrious, studious, painstaking, self-sacrificing, true to every public trust, charitable and friendly toward those who opposed him.

Fig. 118. Henry Cullen Adams.

II. EXPERIMENT STATIONS IN CANADA

By *William Saunders*

In 1884, The House of Commons of Canada appointed a select committee to inquire into the best means of developing and encouraging the agricultural interests of the Dominion. This committee made a careful inquiry into the subject, taking evidence from various persons who had made a special study of the different branches of industry included under the general term agriculture, and of others having a scientific knowledge bearing on this subject. In the report subsequently submitted to the House of Commons, the committee recommended that the government establish an experimental farm or farms where experiments might be made in connection with all branches of agriculture and horticulture, and that the results of the work should be published from time to time and disseminated freely among the farmers of the Dominion.

In November 1885, action was taken by the government. On the accession of the Honorable, now Sir, John Carling to the position of Minister of Agriculture for the Dominion of Canada, under his instructions the present Director of the farms gathered such information as was obtainable regarding the various experiment stations then in operation in Europe and the United States. Many of these establishments were visited and a report prepared which was submitted during the next session of Parliament. An act was introduced in February, 1886 and passed almost unanimously, authorizing the government to establish a central experimental farm and four branch farms. The central or principal farm was to be located at or near the capital, Ottawa, on the dividing line between Ontario and Quebec where it was to serve the purposes of these two large provinces. The branch farms were to be distributed as follows: One for the maritime provinces jointly (Nova Scotia, New Brunswick and Prince Edward Island), one for Manitoba, one for the Northwest Territories, and one for British Columbia.

The work that was to be undertaken at these several experimental farms was thus set forth in the act:

(*a*) Conduct researches and verify the experiments designed to test the relative value, for all purposes, of different breeds of stock, and their adaptability to the varying climatic or other conditions which prevail in the several provinces and in the Northwest Territories;

(*b*) Examine into scientific and economic questions involved in the production of butter and cheese;

(*c*) Test the merits, hardiness and adaptability of new or untried varieties of wheat and other cereals, and of all field crops, grasses and forage plants, fruits, vegetables, plants and trees, and disseminate among persons engaged in farming, gardening or fruit-growing, upon such conditions as are prescribed by the Minister of Agriculture, samples of such surplus products as are considered to be specially worthy of introduction;

(*d*) Analyze fertilizers, whether natural or artificial, and conduct experiments with such fertilizers, in order to test their comparative value as applied to crops of different kinds;

(*e*) Examine into the composition and digestibility of foods for domestic animals;

(*f*) Conduct experiments in the planting of trees for timber and shelter;

(*g*) Examine into the diseases to which cultivated plants and trees are subject and also into the ravages of destructive insects, and ascertain and test the most useful preventives and remedies to be used in each case;

(*h*) Investigate the diseases to which domestic animals are subject;

(*i*) Ascertain the vitality and purity of agricultural seeds; and

(*j*) Conduct any other experiments and researches bearing upon the agricultural industry of Canada, which may be approved by the Minister of Agriculture.

The work of the Canadian stations.

In October, 1886, the writer was appointed Director of the Experimental Farms for Canada, and, under Sir John Carling, was intrusted with the work of selecting the necessary sites and of choosing the officers required to carry on the work of the several institutions. Within two years the land for the several farms was secured, the necessary officers appointed, most of the buildings erected, and the farms put in practical operation. The central farm was located near Ottawa, the branch farm for the three eastern provinces at Nappan, Nova Scotia, a central point near the boundary of New Brunswick and fairly convenient to Prince Edward Island. The experimental farm for Manitoba was placed at Brandon, that for the North-West Territories at Indian Head, in Saskatchewan, and the farm for British Columbia at Agassiz, in the coast climate of that province.

In choosing these sites, the purpose as to climate was to have them so located as to be fairly representative of the larger settled areas in their provinces, while in the arrangement of the work such experiments as would be most likely to be beneficial to the larger number of settlers in each case were among the first to engage the attention of the officers in charge.

Twenty-two years have passed since this work was inaugurated, and, during that time, Canada has made unprecedented advancement. This progress has resulted in improvement of the condition of the agricultural population all over the country and in a vast increase in the exports of agricultural products. Investigations and experiments have been conducted in nearly all the lines of work laid down in the Act under which these farms were established, and a great mass of important facts has been accumulated in all branches of agriculture, as may be seen in the annual reports and occasional bulletins presented to the government.

When the Canadian experimental farms were planned, it was intended that they should become bureaus of information to which farmers could apply for aid. Evidence of their usefulness is furnished in the rapid increase in the correspondence had with farmers in all parts of the Dominion. In 1889, the year after the farms had become fairly organized, the number of letters received in all was about 8,000. For the past ten years they have averaged about 70,000 per annum. In addition, about 250,000 reports and bulletins are sent out annually. There is thus a constant flow of information going to Canadian farmers from all the experimental farms. Farmers are also encouraged to visit the farms and inspect the progress of the work and many thousands avail themselves of this privilege, annually.

The principles that underlie successful crop-growing are being continually dealt with. Prominent among these are the following:

Maintaining the fertility of the land, mainly by the proper care and use of barnyard manure and the plowing under of green clover, thus adding fertility and humus; testing of artificial fertilizers; adopting a judicious rotation of crops; following the best methods of preparing the land; early sowing; choosing the best and most productive varieties; selecting seed true to name, plump and well ripened.

The object lessons that have been given in the growing of fodder crops, such as grasses, clovers, alfalfa and Indian corn, in the converting of Indian corn into silage, have greatly stimulated the dairy industry, especially the manufacture of butter in winter. The fattening of steers has also been encouraged and thus profitable employment has been found for farm labor in the winter months. The experiments conducted with reference to the economical production of butter of the highest quality have commanded the attention of those engaged in this special industry. The experience gained by the feeding of cattle, sheep and swine and in the testing of those breeds specially adapted to produce the highest quality of beef, pork and mutton has aided and stimulated the stock industries.

The business in eggs and in dressed fowls for the table, has also been advanced by the publication of the results obtained from experiments conducted with poultry.

Many varieties of grain have been brought to Canada for test at the experimental farms from nearly all the grain-growing countries of the world. New sorts of wheat, barley, oats and peas have also been produced in the cereal division by cross-fertilizing with the object of combining the good qualities of varieties, more especially with a view to earliness in ripening, increased vigor, high quality and productiveness. Experiments in the selection of varieties have also been conducted with similar objects. Since the experimental farms were established, several thousand sorts have thus been produced and tested, and among these are quite a number of promising kinds, some of which ripen so much earlier than the standard sorts as to provide for the extension of the wheat-growing area for a considerable distance north of its former limits. The most promising kinds of wheat are ground in an experimental flour-mill at the central farm, where conveniences are also provided for determining their relative quality for bread-making.

After careful and continued experiments have shown that any variety is specially promising, such variety is cultivated on a large scale so as to admit of its free distribution among the farmers of the Dominion. The grain is usually grown at Indian Head or Brandon, where the area of land is large. Most of this is forwarded to Ottawa and distributed from there in strong cotton bags containing five pounds each of wheat and barley, and four pounds of oats, enough in each case to sow one-twentieth of an acre. These samples are sent on personal application only, and only one variety can be had by an applicant each year. With this restriction, the number of farmers supplied each year, for the past ten years, averages about forty-thousand. The number supplied during the season of 1906 was 47,723.

It is remarkable how rapidly a supply of grain may be built up from a single four- or five-pound sample. Take for instance a sample of oats. A four-pound sample will, if well cared for, produce from three to four bushels. This, sown on two acres of land, will, at a very moderate estimate, give 100 bushels, sometimes much more, but at that rate the crop at the end of the second year would be sufficient to sow fifty acres, which at the same moderate computation would furnish 2,500 bushels for seed or sale at the end of the third year.

Every season after the regular distribution of samples has been provided for, the surplus grain not needed for seed has been sold to farmers, usually in quantities of two bushels to five bushels each. In this way from 200 to 250 farmers are annually supplied with these larger quantities. By these distributions, new or improved varieties are soon spread over the whole country, and by the frequent introduction of pure samples from which a fresh start is made, the average high quality of the general crop is fairly well maintained.

The practical help that has been given by the officers who have charge of the entomological and botanical work has also been a source of satisfaction to the public. The information disseminated as to the life history of noxious insects and the best remedies for their destruction, also the best methods of treatment of those fungous diseases from which grain, fruit and other crops sometimes suffer, have been much appreciated by farmers and fruit-growers. The subject of noxious weeds has been fully investigated and the best methods of subduing them pointed out.

In the chemical division, the investigations have covered a wide field. Numerous analyses have been made of different sorts of grain and information gained on their relative quality; also of concentrated foods for stock. Many fodder plants have been analysed at different stages in their growth to ascertain, in each case, the period when the plants may be cut to the greatest advantage. In many other lines of chemical research bearing on agriculture, much valuable information has been given regarding the care and the action of manures, the value of legumes when plowed under to enrich the land, the usefulness of mucks, muds and marls as fertilizing agents, also on the composition of soils in different parts of the Dominion, and on many other kindred subjects.

In the horticultural division, similar close attention is given to the growing of such fruits as are likely to be most profitable in different districts, so that the large export trade in fruits in the Dominion may be encouraged and increased. Experimental shipments are also made to distant markets to gain information as to the suitability of different varieties for this purpose. Much attention has been given to the production by cross-breeding of fruits of high quality for the more favored fruit districts, also of varieties hardy enough to be grown successfully in the colder sections of the country. Considerable attention is also given to the growing of vegetables.

The scientific work is conducted mainly at the central farm, where suitable buildings and appliances are available and a competent staff is provided to carry on the work. At the branch farms, the more practical work is done in connection with experiments in the growing of agricultural crops, fruits, vegetables, trees, shrubs and flowers in order to find out how far these may be adapted to the particular climate in which they are being grown.

The superintendents of the branch farms report every week to the Director at Ottawa, on printed forms provided for that purpose, giving a summary of the work in progress, notes on the weather and condition of crops or stock, the number of men employed and the work they have been engaged in. About the middle of each month, statements are sent to Ottawa of the expenditures, with vouchers for the previous month and an estimate made of the probable requirements of the current month. A check is forwarded covering the amounts required and the workmen are paid at the end of each month. Once a year the Director visits each branch farm and inspects the progress being made and confers with the superintendents as to the work for the following year. The superintendent of each branch farm prepares an annual report of the work accomplished under his charge, which forms part of the annual report of the experimental farms. One thousand copies of each of these reports of branch farms are printed separately for the personal and local use of the superintendent. The permanent mailing list of the farmers of the Dominion is kept at the central farm, at Ottawa, from whence most of the farm publications are mailed, and any farmer may have his name entered there by application. The publications are all printed at the Government Printing Bureau in Ottawa.

The experimental farms of the Dominion are sustained by direct grant of the Parliament of Canada, the vote for the year 1908 and 1909 being $130,000 for the seven farms now in operation. In addition to the five farms already mentioned, two new branch farms have been established during the past year, one at Lethbridge, in Southern Alberta and one at Lacombe, in Northern Alberta. The results of this work have been so satisfactory that it is the intention of the government to start several more of these branch farms in other parts of the Dominion.

SCOPE AND WORK OF COLLEGES OF AGRICULTURE

The establishment of the agricultural and mechanical colleges was a revolt from the older education or a protest to it. It was the desire of the newer education to set the pupil into relation with his environment and to fit him for the work of the world.

The American colleges of agriculture that first gained prominence were the separate institutions, not those connected with universities. It was thought that the so-called classical institution and the agricultural college were incompatible and inconsistent in aim. But the underlying motive of this separation, even if not recognized by the early contestants, was undoubtedly the feeling of protest against a system. To have joined the agricultural college with the university would have yielded the very point of the controversy. The immediately practical problem was the fear that agricultural students would be "looked down upon" if they were compelled to associate with other students. This fear was not without foundation, particularly in the early days; but the cause of this discrimination is not alone the subject that the student pursues, but the fact that the agricultural student was not always on the same academic footing with the other. When students of high-school grade associate with those of collegiate or university grade, the former are likely to be subjected to discrimination, whatever the study they pursue. It has also taken time to overcome the prejudice against industrial and applicable education, in general. Equivalent entrance requirements, thorough instruction, broadly equipped teachers, bring the agricultural student into parity with his associates. This has been shown, beyond all question, in the recent history of agricultural teaching.

The practical result of this disparity has been to cause the agricultural colleges constantly to advance their entrance requirements, to attain the same academic rank as higher institutions of learning, and to confer equivalent degrees. They have thereby tended to grow away from the "plain people," and they have in some measure made themselves incapable of serving the very ends for which many of their friends designed to have them established. In the early days of the agricultural colleges the field for work of a distinctly collegiate or university grade was not always foreseen. It was expected that the agricultural college should stand in intimate relation with the plain farmer. The early discussions clearly show that directly practical institutions were commonly in mind; but events have shown that leadership and ideals were most needed. We are still in need of the practical school of intermediate and secondary grade.

Plate XIX. The great Northwest. Farm scene in Alberta. Canada

There is room for a very few agricultural institutions of the very highest or university grade. These institutions are already in existence. They train investigators and teachers as well as farmers. Their purpose is less to make farmers than to educate men. Such an institution always profits by being connected with other educational departments. This connection may come about from association with a university, or the enlarging of the curriculum of the institution. The Land-Grant colleges of agriculture are properly not technical or professional schools; they develop men and women by means of agricultural and country-life subjects.

The colleges of agriculture, in other words, now stand for the whole range of country life in both its productive and social phases. State colleges or teaching departments of forestry and of veterinary medicine, for example, are properly parts of an agricultural college organization, although they have not always been so regarded. They are parts of such a college because their subject-matter is agricultural (Vol. II, page 312; Vol. III, page 15). This relation is recognized by the United States government, the Forest Service and also the veterinary work (except in the army) being a part of the United States Department of Agriculture. Both subjects deal directly with the productiveness and profitableness of the land. Veterinary colleges have been recognized chiefly as professional institutions giving medical degrees, and have been associated with medical colleges rather than with agricultural colleges. It is probable that, in the future, they will be associated with both these institutions, but their administration will necessarily be connected very closely with the colleges of agriculture. In most of the Land-Grant institutions, the veterinary work is a department of the college of agriculture. There are various reasons why veterinary work should be very closely associated with the colleges of agriculture, aside from the fact that the veterinary work is properly agricultural subject-matter. All students in an agricultural college should have the opportunity to receive instruction in the physiology and diseases of animals in order that they may develop a point of view that will give them a trained intelligence on the management of animals and herds in disease or accident. Such instruction would best be given by persons who are themselves trained veterinarians. This kind of instruction, however, would scarcely be given in a veterinary college which is wholly separate from direct agricultural associations and which has devoted all its energies to professional medical work. On the other hand, all veterinary physicians should have an agricultural point of view, for they deal with agricultural subjects and very many of them are to practice in rural communities. Their work rests on the animal husbandries. It is to these men that we ought to be able to look for the best aid in the control of bovine tuberculosis and in much other management of animals; and to do this they must have a trained intelligence on agricultural matters. They should now hold much the same relation to sanitation of farm stock that the regular physicians hold to sanitation with human beings.

There is also much need of extension work in veterinary subjects. The public are in great need of it and are beginning to demand it. It will no doubt be many years before the etiquette of the medical profession will allow veterinary colleges to engage in such work, but it could be conducted in a combined institution without offense. A state veterinary institution should stand for all persons who own animals, as well as for those who treat animals. Moreover, a modern veterinary college needs much land for field experiments and for tests. Mere laboratory work and stable experiments cannot solve the problems involved in many of the animal diseases, and cannot elucidate the practical farm problems involved. It will probably be found that such farms, when maintained by the state, can be more economically and effectively administered in combined institutions than in separate ones.

Every effort should be exerted to safeguard the value of the professional veterinary degree, and the professional faculty of the veterinary college would necessarily have its existence as a separate unit in a college devoted to agriculture in a broad sense; but this need not in the least interfere with such a union of effort as will produce the best results for the students and for the agricultural interests of any commonwealth. These two institutions cannot be wholly separate and yet serve the commonwealth to the best advantage.

The above statements apply with equal force to colleges of forestry. These colleges, like the veterinary colleges, may prosecute two somewhat distinct but coördinate lines of work, one being the course of study leading to a professional degree of, say, forest engineer, and the other being the general educational work that has the usual farm conditions in view. There is no reason why a highly developed college of agriculture, or a medical division of it, should not confer the degree of veterinary medicine and the forest division of it, the degree of forest engineer, if it had the faculties and equipment to enable it properly to carry the work. The professional people, as physicians and engineers, might not at present welcome the idea of a degree from a college of agriculture, being prejudiced against the name; but this will change.

It is not too much to say that the colleges of agriculture are now making the best contribution to constructive pedagogy, and for these reasons: They are interested in all persons, rather than in developing a special or professional class; they attack the common daily problems of life; their methods are direct and untraditional.

I. The Early Curriculum

It was a common opinion fifty years ago that "agriculture" was a one-professor subject, although this was not at all the view of the leaders in the movement for colleges of agriculture: the one professor was to carry his subject as another man carried Latin or mathematics. The agricultural curriculum in the early days of the Land-Grant colleges was formed on the lecture-course and recitation method. It was an arts course with the addition of natural science. The courses were prescribed, in one set line of work. The application-of-science idea was dominant in the work. It will be suggestive to reproduce four types of the very early schedules (for the first Michigan schedule, see page 403; and for Farmers' College, see page 372).

1. *Sheffield Scientific School, Yale.* 1866.

The main features of the course are, in addition to the mathematical and general studies of the first year, extended instruction by lecture in the Theory and Practice of Agriculture in all its branches; instruction in the French and German languages, in the accessory sciences, Chemistry, Botany, Zoölogy, Geology, Meteorology, and training in free-hand Drawing and experimental Chemistry.

Program of Studies

Junior Year

Agricultural Chemistry and Physiology. — Structure and Physiology of Plants; Water, Atmosphere, and Soil in their relations to Vegetable Production; Improvement of the Soil by Chemical and Mechanical means. Domestic Animals: the chemical relations of their Food, Digestion, Respiration, Assimilation, and Excretion; Milk, Butter, Cheese, Flesh, and Wool as Agricultural products. Lectures. *Experimental and Analytical Chemistry.*—Laboratory practice. *Meteorology.* — Academical Lectures. *Physical Geography.* — Lectures. *Zoölogy* — Lectures. *Drawing.*—Free-hand practice. *French and German.*—Continued. *Excursions.*—Botanical, Zoölogical, etc.

Senior Year

Agriculture.—The staple crops of the United States, their varieties, cultivation, management, and preparation for market. The Care, Breeding and Raising of Domestic Animals. Lectures and Recitations. *Experimental Chemistry.* — Laboratory practice. *Agricultural Zoölogy.* — Natural History of Domestic Animals; Insects useful and injurious to Vegetation. Lectures. *Human Anatomy and Physiology.*—Lectures. *Geology.*—Lectures and Recitations. *Rural Economy*, both American and foreign. Lectures. *French and German.*—Continued. *Excursions.*—Botanical, Zoölogical, etc.

Opportunities are offered for more special attention to Horticulture, Forestry, or to any of the sciences taught in the course, in their application to particular departments of Agriculture. Many important topics in Agricultural practice not mentioned in the above brief programme — for example, the selection and care of implements; farm buildings; fencing; plan of work for the year as adapted to the season, etc.; methods of conducting farm experiments, etc., etc.—will also be suitably discussed.

Excursions in the neighborhood, and occasionally to a distance, under direction of the Professors, will teach the modes of observing natural objects, especially plants and insects useful and injurious in Agriculture, and will furnish illustrations of live stock, of farm buildings, of orchards, market gardens, use of implements, etc.

A museum of soils, fertilizers, agricultural products, and useful and injurious insects, and numerous diagrams for illustration, are provided, and students have access to the collections in the various departments of science, with which the College is provided.

A shorter course is open to maturer persons who wish to devote a limited time to a selection of the more practical topics. For admission to this course no examination is required; but testimonials of good character and ability to profit by the instruction must be presented.

2. *Massachusetts Agricultural College.* 1867.

1. Special Course

Lectures commencing with the Spring Term, embracing in part the following subjects:—

Structural Botany, Propagation and Cultivation of Plants, History of Cultivated Plants, Pomology, Practical Agriculture, Agricultural Chemistry, Physical Geography and Surface Geology, Natural History of Domestic Animals, Comparative Anatomy, Diseases of Animals, Milch Cows and Dairy, Sheep Husbandry, Insects Injurious to Vegetation, Fuel—its origin and preparation, Rural Architecture.

A portion of these lectures will be delivered by the president and professors of the College. But among those who have promised their aid in carrying on this course are Hon. Marshall P. Wilder, Dr. George B. Loring, E. W. Bull, Esq., and C. L. Flint, secretary of the Board of Agriculture.

This course of lectures will be especially for the benefit of those whose circumstances are such that they can devote but a short time in winter to study. It is but extending and rendering more complete the plan of the Board of Agriculture, in holding yearly meetings for lectures and discussions. While these lectures will not take the place of the regular college duties, the arrangement of the lectures and college studies will be such that students who remain three years in College, will be able to hear all the lectures of the special course.

2. Regular Course

Freshman Year

First Term. — Algebra; English Language; Human Anatomy; Botany. Lectures on the Preservation of Health and Methods of Study.

Second Term.—Geometry; Drawing; French; General Chemistry and Mineralogy. (Recitations and Lectures.)

Third Term.—Geometry; Drawing; French; General Zoölogy; Botanical Analysis.

Members of the Freshman Class will be allowed to attend at least one lecture daily of the special course on Agriculture, in such departments as the Faculty shall determine.

Sophomore Year

First Term.—Trigonometry; Surveying; Mensuration; Agriculture; Physical Geography; Applied Chemistry and Mineralogy. (Recitations and Lectures.)

Second Term.—Analytical Geometry; German; History. Farm Management by lectures; Book-keeping and Farm Accounts; Laboratory Practice.

Third Term.—German; Comparative Anatomy; General Geology; Landscape Gardening and Rural Architecture.

Lectures. — Diseases of Domestic Animals; Physical Properties of Soils; Drainage.

Students of the Sophomore Class will be allowed to attend one lecture daily of the special course, on such subjects as the Faculty may determine.

Junior Year

First Term.—Mechanics and Optics; Political Economy; English, French or German Literature or Calculus, (optional).

Lectures.—Horticulture; History of Useful Plants.

Second Term.—Engineering; Hydrostatics; Analytical Chemistry, Laboratory Practice; Forestry; Industrial Statistics.

Lectures.—Magnetism and Electricity.

Third Term.—Astronomy, Climatology; Animal and Vegetable Physiology, with special reference to Breeds and Varieties; Rhetoric; Laboratory Practice.

Lectures.—Entomology, Bee Culture, etc.

Students in the Junior Class will have the privilege of attending one lecture daily, of the special course, on such subjects as the Faculty shall determine.

Senior Year

First Term.—Civil Polity; Intellectual Philosophy; Economic Geology and Mining.

Lectures.—Law relating to Rural Affairs.

Second Term.—Moral Philosophy; Logic; Æsthetics; English Literature.

Lectures.—Architecture.

Third Term.—Special Subjects; Reviews.

Seniors attend any lectures of the course.

Military Tactics; Declamations; Discussion and Themes during the whole course.

The first term of the College will commence October 2, 1867. The first year provision will be made for a freshman class only.

3. *Cornell University*, 1868–9.

The Full Course of Twelve Trimesters, or Four Years.

FIRST YEAR.—*Fall Trimester.*—Algebra; English language and vocal culture; French; and human and comparative physiology. *Winter Trimester.*—English language and vocal culture; French; geometry; history; and zoölogy. *Spring Trimester.*—Botany; embryology; English language and vocal culture; French; and trigonometry.

SECOND YEAR.—*Fall Trimester.*—Chemistry; English literature and elocution; experimental mechanics; German; psychology; and vegetable physiology. *Winter Trimester.*—Chemistry; elementary geology; English literature and elocution; German; philosophical anatomy; and physics. *Spring Trimester.*—Acoustics and optics; chemistry; book-keeping (or laboratory practice); German; and physics.

THIRD YEAR.—*Fall Trimester.*—Agricultural and economic botany; agricultural chemistry; English literature and rhetoric; and veterinary anatomy and physiology. *Winter Trimester.*—Agricultural chemistry; agricultural and economic botany; English literature and rhetoric, horticulture; and veterinary medicine and surgery. *Spring Trimester.*—Agricultural chemistry; arboriculture; English literature and rhetoric; landscape gardening and veterinary medicine and surgery.

FOURTH YEAR.—*Fall Trimester.*—Agricultural chemistry; agricultural geology; astronomy (or comparative anatomy and history); practical agriculture; and rhetoric and oratory. *Winter Trimester.*—Agricultural architecture; agricultural technology; practical agriculture; moral philosophy and political economy; and rhetoric and oratory. *Spring Trimester.*—Agricultural mechanics; architecture and rural economy; practical agriculture; international and constitutional law; and meteorology.

A Course of Nine Trimesters, or Three Years

FIRST YEAR.—*Fall Trimester.*—Chemistry; English language and vocal culture; human and comparative physiology; vegetable physiology; and either algebra, experimental mechanics, or the modern languages. *Winter Trimester.*—Chemistry; elementary geology; English language and vocal culture; history; zoölogy; and either geometry, modern languages or physics. *Spring Trimester.*—Book-keeping; botany; chemistry; embryology; English language and vocal culture; and either modern languages, physics or trigonometry.

SECOND YEAR.—Same as the third year of the full course.

THIRD YEAR.—Same as the fourth year of the full course.

Those taking mathematics or physics, during the first year, will be required to devote eight hours weekly to laboratory practice, while those who take the modern languages will be obliged to practice but two hours a week.

A Course of Six Trimesters, or Two Years

FIRST YEAR.—*Fall Trimester.*—Agricultural chemistry; English language and vocal culture; human and comparative physiology; veterinary anatomy and physiology; and either experimental mechanics or additional laboratory practice in chemistry and veterinary surgery. *Winter Trimester.*—Agricultural chemistry; English language and vocal culture; veterinary medicine and surgery; and either physics, zoölogy, or additional laboratory practice in chemistry or veterinary surgery. *Spring Trimester.*—Book-keeping; botany; English language and vocal culture; horticulture; veterinary medicine and surgery; and either agricultural chemistry or embryology.

SECOND YEAR.—*Fall Trimester.*—Agricultural chemistry; agricultural and economic botany; English literature and elocution; practical agriculture; and vegetable physiology. *Winter Trimester.*—Agricultural architecture; agricultural and economic botany; agricultural technology; English literature and elocution; general agriculture; and horticulture. *Spring Trimester.*—Arboriculture; agricultural mechanics; architecture and rural economy; practical agriculture; landscape gardening; and meteorology.

Text Books.—Caldwell's "Agricultural Chemical Analysis;" Johnson's "How Crops Grow;" Gray's "School and Field Book of Botany;" Gray's "Manual of Botany;" Darlington's "Useful Plants;" Thomas's "American Fruit Culturist;" Kemp's "Landscape Gardening;" Gamgee and Law's "Anatomy of the Domestic Animals;" Gamgee's "Domestic Animals in Health and Disease."

Books of Reference.—Morton's "Cyclopædia of Agriculture;" Anderson's "Agricultural Chemistry;" Knop's "Kreislauf des Stoffs;" Boussingault's "Chimie Agricole;" Fresenius's "Chemical Analysis;" Gray's "Structural Botany;" Lindley's "Vegetable Kingdom;" Downing's "Landscape Gardening;" Chauveau's "Anatomie comparée des Animaux domestiques;" Colin's "Physiologie comparée des Animaux domestiques;" Bouley and Reynal's "Dictionnaire de Médecine Vétérinaire;" Percivall's "Hippopathology;" Low's "Domestic Animals;" Stewart's "Stable Economy;" Dobson on "The Ox;" Leyh's "Handbuch der Anatomie der Hausthiere."

4. *Iowa Agricultural College*, 1871.

The Iowa college early began to differentiate its courses, as the following exhibit of work in the Agricultural Department shows:

Agricultural Course

Freshman Year

First Term.—Analysis of English Language—Rhetoric; Algebra; Book-Keeping; German, French; Freehand Drawing.

Second Term.—English Literature; Geometry; Physiology; Physics; German, French; Freehand Drawing.

Sophomore Year

First Term.—General Chemistry; Trigonometry and Surveying; Botany; Physics; Horticulture: Lectures on hot-bed culture, propagation of plants, seedlings, grapes and small fruits.

Second Term.—General Chemistry and Qualitative Analysis; Zoölogy; Botany; Mechanics; Stock Breeding, Lectures; Farm Engineering, Lectures on Plowing, Draining and Fencing.

Junior Year

First Term.—Quantitative Analysis; Vegetable Physiology; Entomology; Orchard Culture; Landscape Gardening.

Second Term.—Physics; Agricultural Chemistry, with analysis of soils, manures, etc. Farm Engineering: Lectures on road-making, water-supply, farm machinery, and rural architecture.

Senior Year

First Term.—Mineralogy and Geology; Political Economy; Comparative Anatomy and Physiology; Formation of Soils; Rotation of Crops; Management of Stock.

Second Term.—Psychology; Veterinary Science and Practice; Constitutional Law; Fruit Culture; Forestry; Cultivation of Crops; Meteorology.

Horticultural Course

For the Freshman, Sophomore and Junior years the course is identical with the Agricultural Course.

Senior Year

First Term.—Mineralogy and Geology; Political Economy; Comparative Anatomy and Physiology; Formation of Soils; Market Gardening.

Second Term.—This course is identical with the Agricultural Course.

Students in this course have special privileges and instruction in the practical operations of the garden. They may at their option have their labor exclusively confined to it.

Course in Stock Breeding

For the Freshman, Sophomore, and Senior years the course is identical with the Agricultural Course.

Junior Year

First Term.—Quantitative Analysis; Vegetable Physiology; Entomology; History of different Breeds of Domestic Animals; Landscape Gardening.

Second Term.—To the studies of the Agricultural Course, add the Treatment and Training of Domestic Animals.

Students in this course have special privileges and instruction in the care of Domestic Animals, treatment of their diseases, etc., and may be confined to this work if they so choose.

Nursery Course

For the Freshman Year the course is identical with the Agricultural Course.

Sophomore Year

First Term.—Same as Agricultural Course.

Second Term.—To the Agricultural Course, add the Management of Seedlings and Small Fruits.

Junior Year

First Term.—To the Agricultural Course, add Grafting and Budding.

Second Term.—To the Agricultural Course, add Cultivation and General Management of the Vineyard.

Senior Year

First Term.—For Stock Breeding in the Agricultural Course, Substitute Flowers and Flowering Plants.

Second Term.—To the Agricultural Course, add Soils for Different Fruits.

Students in this course have special privileges and instruction in the care and management of the Nursery, the Orchard, and Vineyard, and they may at their option confine their labor to them exclusively.

II. THE PRESENT AND FUTURE CURRICULUM

A college of agriculture has now come to be a highly complex institution. It is expensive to equip and maintain. It requires a very large staff, for the demands on it are of great variety and extent. The nature of the content of a modern college of this kind we may now briefly examine.

The dividing of the subject-matter.

The great agricultural specialties have now arisen, with an expert to teach each one of them. Out of the agricultural department of the old days have sprung agricultural chemistry (when "agriculture" did not come out of chemistry), horticulture, various phases of zoölogy and botany, and other subjects. Animal husbandries split off, and the dairy subjects. Then the field remaining to the professorship of "agriculture" was denominated "agronomy," an indefinite term that really has no integrity (Vol. II., page 191). Out of this have been taken farm mechanics and rural engineering and rural architecture, leaving it with field crops and farm management.

The process of division of the curriculum has not stopped here, nor will it stop with even the most advanced schedules that have yet been made. In some of the colleges of agriculture, every one of the agricultural subjects or specialties will in time be represented by a professor, or equivalent officer, and be provided for in a course of study. More than one hundred separate agricultural courses are now given in some of the colleges in this country. Very few of the departments now represented in even the best of these colleges are divided into their natural primary divisions or entities. The animal husbandries must be represented by groups or departments standing for the different classes of animals, as for sheep, swine, horses, cattle, poultry, fish. In fact, in time there will be distinct departments representing subdivisions of these groups, as "beef cattle" and "dairy cattle:" such division is already beginning to be made.

The horticultural departments do not represent entities, but combinations of subjects which, for reasons of convenience in administration, have been thrown together. There is no greater unity between fruit-growing and flower-growing, than between fruit-growing and grain-growing, and no more reason why they should be thrown together. On the crop side, it is probable that we shall eventually have such college divisions as cereal crops, flower crops, fruit crops, fiber crops, drug crops, and similar groups. It is probable that all the leading single crops, as cotton, wheat, maize, will themselves be represented by professorships. With such divisions, the present departments of horticulture, agronomy, farm crops, field crops, and others, must disappear.

In the early days, the colleges of agriculture concerned themselves chiefly with the regular courses of study. As the colleges have grown and the field has enlarged, however, the work has gradually differentiated itself into several large groups or lines of activity. A highly sustained college of agriculture has three more or less coördinate kinds of effort: (1) The regular academic or college work, represented in the curriculum or courses of study; (2) the extension work, or the activities that are wholly or mostly outside the institution itself; (3) the experiment or research work, which is now represented chiefly by the experiment station side of the college. If the college is connected with a university, or if it is itself essentially an industrial university, then it will necessarily add a fourth division, which will be university or post-graduate work as distinguished from college or undergraduate work.

Ideally, every department in a well-specialized college should have officers representing each of these lines of activity. There will be persons in the department of dairy industry, for example, who devote the major part of their time to university or post-graduate work, others who give their attention to the teaching of undergraduates, others who devote their energies chiefly to experiment and research, and still others who engage in the publicity, propagandic or extension work in that subject. Such an organization in all the departments would round out the proper activities of a college of agriculture and enable it to do the real work for which such colleges exist. There are no colleges of agriculture as yet, however, that fully are organized on this basis. [See discussion of extension work on page 449.]

An experiment station or research institution should be organically connected with every college of agriculture, both for the sake of the college and the station. It is impossible to separate teaching functions and investigation functions. All teaching needs to be vitalized by the enthusiasm that comes from continuing research work. The teacher who is always exploring new fields is alive and, other things being equal, is the best able to impress and lead his students. An agricultural college in which there is no research work is bound to be sterile, its work lacking vivacity and energy. An experiment station or research institution should also be greatly benefited by connection with a good college, because the officers engaged in research are constantly challenged by a body of bright students and by association with a larger company of men. There is, to be sure, danger that the energies of persons who are to spend their time in research may be dissipated by too much teaching if the research institution is connected with a college; but this is a question of administration and funds, and can be overcome.

In determining a curriculum for a highly developed college of agriculture, it is first necessary to determine what its functions are conceived to be. At first these institutions stood chiefly for education in the technical or occupational agricultural subjects,—concretely, with the problems of increasing the productiveness and profitableness of farming. Gradually, however, they have enlarged their scope to cover all the activities that are peculiar or applicable to the open country as distinguished from those that center mostly in the city, and to use these subjects broadly as a means of training persons for life and for general citizenship. Not only must the productiveness of land be increased, but the ideals of living must be elevated and all rural institutions must be quickened. The modern agricultural college concerns itself with large public questions of education, trade, transportation, and general betterment, standing for all agencies that will aid in making the farmer a more efficient producer of wealth and a more effective citizen.

In organizing such a college, the keynote should be equality. It is gratifying to have a large number of students, for this indicates the public estimate of the work; but it is more important that every kind of work be unexcelled for truthfulness and effectiveness. There is undoubtedly a tendency to introduce subjects merely because they are demanded, and also to teach them in a superficial and exploitational way, and thereby to miss or overlook the educational values. In the short and special courses, the students may very properly be put at once into practical and technical agricultural work, but if the student pursues a regular degree-course he should proceed through the necessary fundamental subjects slowly and painstakingly. It is no part of the business of a college of agriculture to "hold" its regular students by giving them premature application-courses: these colleges are now sufficiently established to enable them to choose their students and to keep only those who want an education.

One of the handicaps to American colleges and experiment stations is the tendency to over-organization in the departments consequent on the great diversity of interests. It is our wish to develop large departments, to have many assistants, to attack many subjects, and to attend many meetings. This requires much executive effort on the part of some officer. The result is that the head of the great departments in the colleges of agriculture can no longer be a productive specialist, but must give a large part of his time to administering affairs of those who are more or less associated with him. Some way should be devised whereby specialists may devote the maximum of their time to their specialties and the minimum to their executive duties. It is advisable, therefore, from this point of view, as rapidly as possible to break up such departments as agronomy, horticulture, animal husbandry, and other customary groups, into their real units, letting each man have the headship of his particular unit, and of no other. This may lead to some lack of solidarity in the integral units that would be separated out of the larger departments, but there should be a great gain in requiring each man to attend to nothing more in the way of business than that which pertains to his own special subject. It will lie with the administration of the institution as a whole to see that disintegration does not result. The work may be solidified by one of three methods: (1) by a dictator in charge of the entire institution, a plan that is inadmissible and unproductive of good results with trained men; (2) by mutual conference, with one of the group acting as chairman; (3) by mutual conference with the director of the college or station of which the department is a part. Either one of these two last modes would work well, depending on the personalities of the officers concerned. That is to say, the solidification of college and station work is a question of directorial oversight.

The kinds of subjects.

It may now be useful to display the kinds of academic teaching that a really vital agricultural college should cover. While it is the purpose of a college of agriculture to train men and women rather than to develop subjects, yet the subject-matter is the means of training, and the pursuit of it should have direct effect on the business of farming itself and on the meaning of country life. Before pursuing the special agricultural subjects, however, the student should be well grounded in fundamental subjects. Aside from studies developing self-expression (as language and drawing) the student should have training in such subjects as physics, chemistry, geology and physiography, biology, physiology, meteorology, climatology, accounts. Leaving out of count, in this discussion, the fundamental arts and sciences, the special classes of subjects that are related directly to production are as follows:

A. The crop-growing group; including
  (1) Plant nutrition (vegetable physiology, much of agricultural chemistry, soils).
  (2) Plant-breeding.
  (3) Plant diseases and disabilities.
  (4) Plans and practices in the growing, handling and judging of kinds of crops (applications of agronomy, horticulture, forestry).

B. The animal-growing group; including
  (1) Animal nutrition.
  (2) Animal-breeding.
  (3) Animal diseases and ailments.
  (4) Plans and practices in the rearing, handling and judging of kinds of animals (including applications of collegiate departments known as animal husbandry, poultry husbandry, and the like).
  The veterinary department would be a part of group B.

C. Farm management.

Aside from these central and more or less technical agricultural subjects (which will comprise many professorships) there are other departments corollary to them or essential to an institution that stands for agriculture and country life in the broadest way. Some of these other lines of teaching are as follows:

Farm mechanics and machinery.—The use of machinery has now come to be a permanent part of the equipment for good agriculture, and the kinds of machines are legion. The principles that are involved in the construction of farm machinery, and the practice, cannot be adequately discussed in most colleges of mechanic arts or engineering, for such colleges have another and special point of view.

Rural engineering.—Under this term are included such field engineering problems as have to do specially with agricultural enterprises, as surveying with reference to land measure, drainage, irrigation, road-making, water-supplies, and many of the lesser problems of bridge-building, traction development, and other construction. Nearly all the land of the open country is to be in farms (using the word farm to include organized and managed forests), and the complete utilization of this land will demand the expenditure of much engineering skill. The engineer will probably contribute as much as any other man to the making of the ideal country life. Professional engineering problems must be left to the technical engineering schools; but training must also be provided from the agricultural point of view and in connection with other agricultural studies. These agricultural engineering subjects are bound to multiply. Irrigation, for example, is not to be confined to arid regions: it must be added to humid regions not only to overcome the effect of drought, but to cause the land to produce to its utmost. Irrigation for humid climates presents a special set of problems, for it must be intimately associated with drainage, and these problems are not yet well understood.

Rural art.—Almost from the first, the agricultural colleges have included landscape gardening in their curricula. In fact, they are the only institutions that have taught it. The subject is considered to be their special province. To this day there is only one professional school in the United States covering this field and that is recently organized at Harvard. At least twenty-two of the Land-Grant institutions are now giving instruction in these subjects.

As a country life and agricultural subject, landscape gardening (or landscape architecture) has to do primarily with the making of the farm property (both the home and the farm) attractive and artistic. In a larger way, it has to do with the preserving and improving of natural scenery, with village improvement, and with the general elevation of taste. The artistic handling of ordinary farm properties must be left largely to the agricultural schools and colleges, because it cannot pay sufficient fees to warrant a professional man to undertake it; moreover, the desire for such handling must be aroused and fostered by educating the man who lives on the land. The entire farm area of a college or university should be laid out with reference to good taste, making it practically a rural park without in any way interfering with its agricultural utilization,—in fact, such lay-out should increase its agricultural utility.

Rural architecture.—Rural architecture is for the most part hopelessly inefficient and therefore hopelessly inartistic. Real farm architecture will not be handled by professional architects because there are no fees in it; and, as in the case of rural art in general, the public sense must be quickened. Moreover, the problems in farm architecture are essentially agricultural problems. This is particularly true of barns and stables. Practically all barn buildings must be rebuilt on fundamentally new lines if farming is to be an efficient business. In the past, barns and stables have been built merely to house and protect produce and animals, rather than to accomplish certain definite progressive ends. The modern ideas of sanitation, whereby dust is to be eliminated, are revolutionizing stable construction, to say nothing of means of securing cleanliness in other ways, of ventilation, of sunlight, water-supplies, and other necessities.

Technology and manufacture.—Several great departments or kinds of work will develop in this field. Dairy manufacture has already reached a very high degree of development in several agricultural colleges, and is completely established in the public confidence, although it was a doubtful innovation only a few years ago. This intelligent dairy manufacture has had an unmeasurable effect on dairy production and products. Therefore it is not too much to expect that comparable results will follow in other lines of agricultural manufacture, particularly in the making of commercial products and the utilization of waste in the great fruit industries. The technology of canning, evaporating, and preserving of fruit is much in need of study in the colleges. These institutions must also undertake the whole subject of the curing of meats and the manufacture of animal products. These subjects naturally lead to consideration of storage, refrigeration and the mechanics of transportation.

Domestic and personal questions.—The home as well as the land must be reached. The home questions are of two categories: The internal, comprising housekeeping and householding subjects; the external, in which the home is considered as part of the community in its relation to school, church, organizations, and various social questions. The farm home should be the ideal place in which to train boys and girls. It should be comfortable, attractive and sanitary. Human food should receive scientific attention. Woman's work should be alleviated and elevated. The work needs reorganization. Mechanical appliances must be brought to its aid. The miscellaneous activities that center about the home have been assembled into courses of study. These courses have received various collective names, none of which is good, because the subjects are miscellaneous and not capable of being closely welded. Of these names, "home economics" seems now to be oftenest preferred. A college of agriculture must have courses in home economics, but it may not need a department of home economics. That is to say, the different subjects comprising such a course should be taught by various specialists, the special home-making subjects to be handled by one or more special teachers, at least one of whom should preferably be a woman and have charge of the assembling of instruction, although she need not necessarily carry the headship of the work. This woman should be a specialist and should teach only in her specialty. All the work should be of positive collegiate or university grade, strictly comparable in every way with other college work, and be founded on good preparation in the fundamental sciences and arts. The term "home economics" is properly only a name of an idea, or of an assembled group of subjects, not of an educational unit.

Economic and social subjects.—The farm is a part of the community and commonwealth. The farmer is a part of society. These economic and social relations must be studied from the farm point of view. These subjects are practically untouched, although the terms "rural economics" and "rural sociology" are coming into the curricula of colleges of agriculture. A large body of thought and philosophy has been developed in these lines in Europe, particularly in Germany. These subjects are in many ways the most important that fall to the field of a college of agriculture. Economic and social questions are proper subjects to be taught in a college of agriculture, so far as they bear on rural questions. They must be founded, of course, on the study of sound principles as taught regularly in arts colleges. The application of them to country life conditions is founded on agricultural thought and practice; and many of the questions are purely agricultural. The historical development of agriculture, as a means of elucidating present conditions, comes within this group of studies. Rural economics is as logically a part of an agricultural curriculum as is agricultural chemistry: it is an application phase of general economics, as agricultural chemistry is an application phase of general chemistry, and "soils" a similar phase of geology. The entire effort of a college of agriculture is devoted to the elevation of country living: that is, it eventuates into social and economic studies. We shall recur to this subject (page 439).

Normal department.—It is devolving largely on the colleges of agriculture to revive and redirect the rural school. The schools must be made effective in their localities. We do not need new subjects in the schools so much as reorganization. Teachers must be trained for the new school, and a good part of the responsibility of training them must rest with the agricultural colleges, because these colleges are near the problem. Regularly established normal work will soon be a part of all such colleges, as it is now a part of some of them. It will be effective in these colleges, because it will have the minimum of pedagogical theory and the maximum of direct experience with realities; a teacher may safely theorize after he has had good experience in teaching.

Extension teaching.—The colleges must train persons to be useful in extension work,—in modes of collecting and presenting subject-matter, leading meetings, addressing audiences, conducting reading-courses, aiding in library effort, and in general lines of competency in work for communities. We are much in need of well-trained men for farmers' institutes and similar work. A regular set of classes will be needed in the most forward of the colleges of agriculture to develop this type of effort, in charge of teachers who are technically trained both in agriculture and in publicity work. Such a department is already in existence in one or two of the colleges.

The coördination of the parts of the curriculum. The minute dividing of the subject-matter in an agricultural college is now proceeding rapidly in the more advanced of the institutions, and it raises serious questions as to the unification of courses for instruction. In the old days, the professor of agriculture coördinated all the work and made a practical unit of it and developed a philosophy out of it. In the present tendency, the courses are becoming so many and the departments divided on such narrow lines, that the student is likely to be bewildered with the multitude of courses, and to receive only a patchy, fragmentary or undirected course. And yet, it is inevitable that the courses shall divide still further.

The solution of the problem of coördination and unification is to provide such departments as shall combine or tie together the work. In determining what this department shall be, we must remember the two great lines of subject-matter with which a college of agriculture deals,—the occupational, and the social or personal. There will need to be a crystallization of tho courses around these two foci. The proper unification of the occupational courses, or those dealing with technical farming, will be about a department of farm management. The crystallization of those that deal with the general social, sanitary, political, religious and personal questions, will naturally be about a department of rural economy. Every well-developed and mature college of agriculture will need to have these two departments, and the probability is that a part of the work of such departments will need to be required of all students pursuing a course for a degree. Having these central or coördinating courses, and receiving advice as to his electives, the student will not be confused and his instruction need not be disintegrated. Such an organization will allow a college of agriculture to differentiate into the greatest number of specialties, such as may be demanded by the progress of our civilization, and will yet provide the means of unifying them so that they will have meaning.

Above all this, the director or president of an agricultural college must act as a unifying agent, not only in questions of purely executive administration, but also in questions of pedagogy. He must see that the work of the various departments is properly related and coördinated, and that students are able to receive such instruction as will cause them to develop symmetrically. It is becoming more and more necessary that the president of a college of agriculture shall not himself teach regular classes, inasmuch as his time will be consumed with the larger questions of organization and relationships. It is a question also, whether the teaching of classes by the president or director would not tend to over-emphasize, in the student's mind, the importance of the subjects that he teaches. The best part of any college or school is its spirit, and it should be the function of the presiding officer to develop it. The best schemes of unification will fail without it.

There seems to be much confusion as between farm management and rural economy (Vol. I, page 142), although the two are clearly enough distinct in intention, however much they may overlap at places. The former deals with internal affairs of the farm, the latter with external affairs. Inasmuch as these two groups of subjects, are so important to the work of the highly-specialized college of agriculture, we may pause to consider them further. They themselves may need to be divided into teaching units.

Farm Management. (By G. F. Warren.)

Farm management calls for the application of all the principles taught in an agricultural college to the management of a specific farm. It has to do with the business affairs of the individual farmer. It is thus distinct from rural economy, which concerns itself with the economic affairs of the rural population. The study of farm management should help a man to answer such questions as the following:

With my capital and personal qualifications, where shall I locate?

What type of farming shall I take up?

How shall I meet the labor problem?

Which farm shall I buy or rent?

How shall I arrange the fields and buildings?

What stock and machinery shall I purchase?

What system of farming shall I follow?

What shall I sell, and where and how shall I sell it?

What income may I expect?

How will this compare with the income that I may expect in some other occupation?

Some of the topics that a course in farm management will consider may be roughly stated by way of suggestion:

(a) *The business relations* of the farmer, including the following and other subjects: Farm accounts and records, not only personal accounts but with the leading factors of the farm business; kinds of property; legal requirements for the sale of property, deeds, abstracts; ways of securing credit and the limits to which one may safely borrow; the real cost of time purchases.

(b) *Farm labor.*—Why it is scarce, and how the problem may be met on the individual farm. We deplore the fact that the boys leave the farms, but there are probably as many men on the farms as are needed there. If more are needed, the need will be indicated by the greater profits in farming. Farmers deplore the high price of farm labor, but the average farmer makes wages only. The higher the wages, the more he makes. The value of staple products is measured by the effort to produce them. This law is true on the average. The world price of wheat is probably very close to the cost of production and transportation. One community may produce it at a loss and another make more than wages. If this law is true, an individual can make more than wages by working harder or by locating where cost is below the average; choosing a farm that will produce out of proportion to cost; locating near market and thereby gain on transportation; increase the production out of proportion to cost (this is the factor that most experiment station work is concerned with); decrease labor or other cost without a proportionate decrease in crop; foresee future shortages and raise produce to meet them.

If by any of these means a farmer can use labor to better advantage than the average, the more he hires the better. If he cannot use labor better than the average, the less he hires the better. Two of the most important means of meeting the labor problem are by the use of more horses per man and by paying higer wages. The wages of the best men are kept lower than they are worth and of the poorest men higher than they are worth. One may often secure twice as valuable a man by paying only 20 per cent more wages.

(c) *The relative advantages and disadvantages of different types of farming,* their relative requirements in capital, distribution of capital, the conditions under which each is most likely to be successful, are farm management questions.

(d) *The choice of a farm* is the most important business transaction that the farmer is called on to make. Lectures on the important points to be considered and practice in the comparison of farms by means of a score-card, are important parts of farm management teaching. A score-card is shown on the following page. A single point may be mentioned to show a method of figuring. On the Per Lee farm every building has running water that has flowed for fifty years at no cost. The Fitts farm has a tank and windmill. What difference in value does the water-supply make? The keeping up of the mill and tanks, and the labor involved, cost about twenty dollars per year. This is 5 per cent on $400; hence, in this respect, the Per Lee farm is worth $400 more, so long as money brings 5 per cent interest. It was also found that it cost $100 more per year to haul milk from the Fitts farm. Similarly this would make a difference in value of $2,000.

(e) *Organization of the farm.*—The most profitable arrangements of fields and buildings is a subject of vital interest. The excessive loss of time in farming short fields and the high cost of fencing are a surprise to one who has never considered the question, as is the loss of time in farming land some distance from the buildings or point of administration. It is important to be able to figure out the cost of equipment of a farm. One of the best ways to learn the cost is to make an inventory of all the property on a farm. The distribution of the capital in real estate, stock, machinery, materials and supplies must be considered. City farmers nearly always err in this respect. They are likely to invest $200 per cow in the barns. This places an annual tax of twenty dollars or more on each cow.

(f) *Farm problems* are the vital part of farm management and should occupy the major part of the student's time. The farm problem involves the application of all the principles taught in an agricultural college to the management of a particular farm. It is the climax of the agricultural course so far as business questions are concerned, while rural economy is the climax in the study of the farm as a human institution. Civil engineers first learn the use of tools and formulas. Then, if they are preparing for railroad work, they lay out proposed lines of track, with estimates of work and cost. Architects, after learning the principles, make plans for specific buildings. Similarly in agriculture, the final school work is to make detailed plans for the management of specific farms, with financial estimates.

The best way to teach principles is by applying them to specific problems. If a person has made a careful plan of a dairy farm, he will be ready to plan a fruit farm when the problem arises. Such a farm plan is written up, as a college exercise, by the following outline:

(1) Description of the farm. Location, areas, fields, soils, previous crops, buildings, fences, markets, etc.

(2) Inventory of property on the farm. (May be replaced by a list of things necessary.)

(3) Proposed system of management. The chief features of the plan outlined for at least five years.

(4) Crops (for given year).
  (*a*) Crop, field, area, estimated yield per acre, total yield.
  (*b*) Cash crops.
  (*c*) Crops for feed, concentrates—roughage—bedding.
  (*d*) Crops saved for seed.

(5) Food for stock.
  (*a*) Cows, horses, hens, etc., each itemized per animal, and total.
  (*b*) Total food required.
  (*c*) Food to be purchased.

(6) Animal products.
  (*a*) Products of wool, milk, lambs, colts, etc.
  (*b*) Products sold.

(7) Receipts itemized.

(8) Expenses itemized.

(9) Inventory at end of year, allowing for depreciation, increases in value, etc.

(10) Financial results.
  Balance equals receipts, less expenses.
  Farm income equals balance, plus or minus change in inventory.
  Labor income equals farm income, plus or minus interest on capital, or 5 per cent on average of two inventories.
  If a tenant farm, labor income of tenant.
  Percentage on investment made by landlord.

In similar way, estimate may be made for a series of years.

The ideal way to end such a course is with a personal problem, each student to make a plan for his own conditions, beginning with his present capital and outlining a means of procedure for securing the farm that he wants. Then make a plan and estimates for managing it, as hired manager, tenant or owner, as the case may be.

Rural Economy. (By G. N. Lauman.)

There is much difference of opinion about the scope and content of rural economy, not to mention the variation in names proposed for this body of knowledge. Rural economy and agricultural economics are the terms most frequently met.

SCORE-CARD OF ECONOMIC VALUE OF FARMS.

	Standard		Points deficient		
	General Farm	Farm			
Size—					
1. Adapted to kind of farming	20				
Fields—					
2. Shape and size	30				
3. Nearness to farmstead	30				
Topography—					
4. As affecting ease of cultivation	30				
5. As affecting production	10				
6. As affecting loss of fertility	20				
Fertility—					
7. Natural	80				
8. Condition	40				
Physicial properties of the soil—					
9. As affecting economy of cultivation	90				
10. As affecting number of days of labor					
11. As affecting loss of soil fertility	10				
12. As affecting kinds of possible crops	20				
Drainage—					
13. Natural	50				
14. Artifical					
Condition—					
15. Freedom from stumps, stones, weeds, waste land, etc.	50				
Climate—					
16. As affecting animal- and crop-production					
17. As affecting number of days of labor					
Healthfulness—					
18. As an economic factor	40				
Location—					
19. Distance to market	40				
20. Roadways	50				
21. Local markets	30				
22. Shipping facilities	20				
23. Neighbors as an economic factor	40				
24. Labor supply of neighborhood	10				
25. R. F. D., telephone, trolleys, etc.	30				
26. Churches, school, grange, etc., as economic factors	30				
Taxes—					
27. Per cent on cash value	10				
Water-supply—					
28. Running water—wells	40				
Improvements—					
29. Site of farmstead	10				
30. House as adapted to needs of farm	60				
31. Other buildings	60				
32. Fences, kind, condition, arrangement	30				
33. Timber, orchards, vineyards, etc.	20				
Additional scores—					
34. For					
Total score					
Areas in acres					
Price asked					
Price per acre					
Price per acre (excluding waste land)					
Estimated value					
Which farm would you prefer to buy?					

Name ____________________ Date ____________________

DIRECTIONS.—If the points are not properly distributed for the kind of farming to be followed, assign what you consider to be correct. The total need not be exactly 1 000.

No points are assigned for climate. This should be considered when judging farms in different regions or at different altitudes, or when topography or proximity to water make a difference in the climate of the farms that are being compared.

The number of points assigned to each subject is not the limit but is suggestive. Deduct more than the total number when it seems advisable. For instance, distance to market may absolutely disqualify a farm if one wishes to sell milk, while it is much less important for grain, hay or sheep farm. Similarly, there are conditions that may call for higher deductions on any of the points. Credits for exceptional values, such as superior fences, large orchards, probability of increase in value, etc., may be added under number 34.

The former is perhaps more acceptable to those who approach the subject from the side of agriculture, while naturally the term agricultural economics is most current among economists by profession who are usually without a knowledge of the technical and natural science side of agriculture. The term rural economy seems to be more comprehensive and definite, particularly when it is considered that there are rural problems not strictly agricultural and yet not those of the city or concentrated community. If the dreams of some social reformers are realized, this intermediate stage between the purely agricultural and the concentrated community will be all-important in the future. The term rural is therefore more inclusive and may be set off against the term urban in all our economic considerations.

We are accustomed to the discussions as to whether agriculture is an art or a science, or both. Above and beyond these considerations, agriculture is an institution, and the oldest institution known to man. As such it has had a wonderfully varied career in spite of the almost universal sameness of its underlying principles, whether of art or of science. Man's earliest economic necessities were satisfied by agriculture and out of agriculture grew the first social structures. In spite of the modern development along the lines of concentration, we are still dependent on the country for the soundest and most necessary elements of both our economic and social life. The social problems have had the good fortune to be early recognized in the changing conditions of our agriculture and thus bid fair to be as well known and directed as are the social problems of the modern factory system and urban communities, which have only of late received their due attention.

The economic problems of the specifically agricultural community are of two very distinct kinds. They are either internal as affecting the individual farm, or external as affecting a number of farms or the community. The former is farm management, and the latter, agricultural economics or rural economy. The problems of plant and animal production, of rotation of crops, of buildings, machinery and other tool equipment, the disposition of the necessary work and the labor available,—all these are some of the problems of farm management, and, in conjunction with the natural factors, form the content of technical agriculture; they are the inside problems that are more or less under the control of the individual farmer on his own place. On the other hand, there is a great body of questions of an economic nature that lies beyond the individual farm and farmer, sometimes called the outside economics of agriculture. This is the field of rural economy. Farm management is no more rural economy than is department-store-keeping political economy. Rural economy is not concerned with the technical production of crops and animals, but with the farmer and the farm in their economic relation to the community in general.

This being, in a broad way, the content of rural economy, we may inquire what are some of the more specific subjects and problems. First and foremost, are problems of land. The United States has reached its limit of free lands. We are entering the stage of agricultural development where such lands and their usual accompaniment of natural fertility will play a less important part than in the past. With the technical problem of the fertility, rural economy is not concerned. The problem of the competition for the limited area is a fundamentally important one and of far-reaching consequence, not only to our economic life and position as a nation but, what is of still greater moment, to the social structure of our country. The conservation of our natural resources must include the conservation of the good features in our land systems, land ownership and distribution, management and production. But these movements in land ownership, management and use, have their laws as well as the reactions in chemistry. The problems of land ownership and tenancy are the very problems which have made and unmade states and nations.

Collateral, and in some respects independent, questions are those of agricultural credit. Even a superficial consideration of the problems of credit lead to a realization of the inherent virtues of a well-ordered credit system, such as we have as yet not had the benefit of in the United States. (Consult the article on page 269.)

Closely connected with the immediate questions of the land are the problems of labor in agriculture. There have been agricultural labor problems from time immemorial, but new solutions of the problem are required with every new system of land tenure.

Another important problem is that of coöperation. Individualistic as is the farmer by nature, and especially the American farmer, the greater virtue of coöperation is still to be acquired.

These random notes illustrate the content of rural economy, given in order to suggest the field. The study of such problems leads naturally to definite programs of action. This brings us to the field of governmental function and action with reference to agriculture. We have no very effective term to cover this field of study. "Granger legislation" we have had, but there is a stigma attached to this name. The Germans use the term "agrarpolitik" to designate governmental action in agriculture, a very effective term in German but not so happy a term when translated into English. We may consider ourselves fortunate in not having had an agrarian party, but we have had agrarian legislation, aimless in the main. The increasing complexity of our agriculture in its various phases will require an increasing and more complex legislation, which must be directed by men trained to appreciate the rural problems. It is significant that up to the present time, we have had no man of statesman caliber to lead the agriculture of the United States. The schools are unable at the present moment to give the foundation training to any one who desires to labor in such a field. What is needed is a sympathetic appreciation of our past agricultural history and present conditions, and a similar appreciation extended to other countries, especially to those of western Europe, where agricultural history has been made under greatly varying conditions. Such appreciation of the past and present, with a resulting program of action, may not solve all the non-technical problems in our agriculture, but it will give us the definiteness of logical action.

Manual labor.

It is interesting to note the conflict of opinion that long obtained respecting compulsory manual labor at the agricultural colleges. One idea, typified in the Michigan Agricultural College, compelled manual labor for the double purpose of enforcing the dignity of labor and of teaching the practical operations of the farm. The opposite idea, typified in Yale and Cornell, considered that manual labor, as such, can be better taught on a farm than at a college or university and that a student really has no time to consume in mere manual work. The compulsory labor system is now extinct in the colleges of agriculture, and in its place there is labor that is educative and illustrative. Compulsory labor has given place to laboratory labor; it is no longer a part of the curriculum.

The controversy over compulsory labor has really turned largely on the confounding of training with education. As the colleges rose in power and efficiency, real college effort came more and more to be emphasized, and apprenticeship and training came more and more to be neglected. There were some institutions that discarded the manual-training idea even from the first. Farmers' College (page 371) was one of these.

Whatever may be the possibilities of compulsory manual labor in secondary, special and private schools, it will not work in the fully developed colleges of agriculture. In the first place, it is impossible to provide real work for any large number of students, particularly in winter; and make-believe work, devised for the occasion, is worse than no work at all. In the second place, it is impossible to run a farm by means of student labor, for such labor is not at command when it is wanted, is forced, and largely unmanageable. The old schemes to make colleges pay their way from the proceeds of the farm by means of student labor have always failed and always must fail, unless the students are few and carefully selected and the educational program wholly subordinated to the practical farm work. Education is one thing, and farming quite another. Manual-labor schools, with a light educational motive, may work well under certain conditions; but of these we are not speaking here.

Moreover, a student cannot afford to go to college to work on a farm for wages. His time is more valuable for study; and it is for study that he goes to college. His farm-practice experience would much better be acquired before he goes to college; and he should secure it, if possible, on a real commercial farm.

The point of view on manual labor in the colleges of agriculture was well stated by Senator Morrill in 1888:

"The Act of 1862 proposed a system of broad education by colleges, not limited to a superficial and dwarfed training, such as might be had at an industrial school, nor a mere manual training, such as might be supplied by a foreman of a workshop, or by a foreman of an experimental farm. If any would have only a school with equal scraps of labor and of instruction, or something other than a college, they would not obey the national law. Experience in manual labor, in the handling of tools and implements, is not to be disparaged; in the proper time and place it is most essential, and generally something of this may be obtained either before or after the college term, but should not largely interfere with the precious time required for a definite amount of scientific and literary culture, which all earnest students are apt to find far too limited.

". . . . For public exhibition an admirable show-farm may thus be provided, often most useful in suggestions of valuable improvements to the community at large; and young college athletes may thus have occasional field days, work in the open air for health and practical experience in manual labor, or as some fractional resource of support; but the general and timely work of such an establishment can only be economically conducted by paid labor regularly employed. This is the general testimony of universal experience. Much valuable brain-work, it is found, leaves little time for any other. It must also be borne in mind that stock-farms are enormous absorbents of capital, and the small annual Land-Grant funds (of some states), after deducting the cost of a model farm, if it could be exclusively devoted to this object, would be likely to be wholly absorbed, and might be found to be insufficient for the experiment. Certainly there would be nothing left for intellectual instruction.

"The question fairly presented is, whether or not the majority of college students in the four-years' course would profit by surrendering any considerable part of such a last opportunity to seek intellectual acquirements, for the opportunity of being drilled in hand-labor, and whether or not state legislatures would authorize and assume the increased annual expenditures which would be involved in the establishment and maintenance of either a model farm or of a general workshop."

What a college farm is for.

We may now inquire what a college farm is for; and hereupon we come on the most difficult pedagogical question in a college of agriculture.

The material lay-out of a college of agriculture may be roughly classified into three categories: the farms; the buildings; the movable property or equipment. Farmers look at a farm from the point of view of practical husbandry; college men look at it from the point of view of education and investigation. There is likely, therefore, to be some conflict of opinion as to just what a college or university farm should be used for.

There has been some division of opinion as to whether an agricultural college needs a farm, but the consensus of opinion now is that a farm is essential to an institution that teaches agriculture. Practically all the institutions founded on the Land-Grant Act have working farms used for instructional purposes. College farms vary greatly in size, but the general tendency seems to be to increase the area. It is much better for educational purposes to have such areas in immediate connection with the college than to have more ideal farming land at some distance removed. In thirty-nine out of forty-eight cases, the farm and agricultural department are closely associated with the college or university, being either adjacent to the college grounds or only one or two miles away. There is only one state or territory (Arizona) in which the college farm is distinctly disconnected from the college or university, the farm at Phoenix being maintained strictly for experimental purposes. In Minnesota, Nebraska, New Jersey and Tennessee the college farms are separated in a measure from other university work although still maintaining a very close connection with the institution, the farm in each case being in close proximity to the agricultural department. In California a farm has been secured a long distance from the seat of the Land-Grant institution, but a school is established in connection with the farm.

We may now consider what use a college farm is to serve. In making these statements, the college or university is in mind, and not the secondary school or training school. In secondary school work, the farm might be used in a very different way from that in which it is utilized with college and university students.

The college or university farm idea has gone through several phases of development. The property was first conceived of in some quarters as a model farm. Of course the model farms came to be the laughing-stock of farmers. This will always be the result. If they are model farms in the ordinary acceptation of that term, they will likely have very little pedagogical value. A person who is a first-class teacher of farming may be a second-class farmer; or, to transpose the statement, a first-class farmer may be a very poor teacher. One farm cannot be a pattern for all the conditions in the state. There are hundreds of model farms in every good agricultural state; for model farms are good farmers' farms. The farms of any state are a part of the working equipment of the agricultural college of that state. The state cannot afford to go into a model farm enterprise in connection with university work.

In some instances, college farms were utilized as areas on which to employ students at farm labor in the hope that by this means the boys would keep in touch with farm work and remain in sympathy with it. This use of college farms has failed of good results. Every college farm will afford some labor for students who need to earn money; but this is a very different matter from requiring every student to work as a laborer. The college farm should supply to every student much educational labor and practice, just as the machine shops supply it to engineering students.

Again, college farms have been run with the idea of making a profit. But one can hardly expect to run a farm with profit by means of student labor (page 442). If the farm returns a profit, it usually means that the teaching effort is reduced. It has been found to be impracticable to run a farm that shall be both a profitable commercial enterprise and an efficient teaching enterprise. Commercial farming is to be exemplified on farmers' farms. It is difficult enough to make a farm support one family, let alone supporting teachers and laboratories and developing the productive power of miscellaneous students, being subject, at the same time, to disabilities of teaching hours and study hours. A commercial farm ordinarily raises a special series of crops or develops in some particular direction, whereas a teaching farm demands a great variety of enterprises and much demonstrative material. If a state is primarily to make money from a farm, then the farm should not be used for college teaching purposes, but be conceived of as an out-and-out business enterprise.

Again, farms came to be used merely to illustrate or display farm practices. Formerly, colleges had museums to which the students could go to examine the wonders. We still need museums, but we must also have collections with which to work. It is not enough that a student see a zoölogical museum: he must also have zoölogical specimens to handle and to use. It is not enough that students merely see crops growing, or see different breeds of animals. They must come nearer than merely to look: they must use and handle them. A college farm should have museums of living animals, varieties of fruits (test orchards), collections of crop plants and other plants, and other things growing naturally.

Again, there has been an idea that a college farm ought to represent the commonwealth, and be typical of the state. It is usually a poor state that can be typified in any one farm. If the state wants a typical farm, it is questionable whether the university or college should be burdened with it. It would be essentially an advertising organization. The pedagogical value of the so-called typical farm may be very slight. Anybody can farm typical land. Of course it is preferable to have a farm as indicative of the state as possible, other things being equal: but if the choice must be made between a typical or representative farm and a pedagogical farm, the area must be chosen that will allow the developing of the most direct and concrete teaching enterprise.

There was a period when the college farm was used very little for college purposes. Not knowing what to do with such areas, some of them have been allowed to drift. The passage of the Hatch Act, in 1887, establishing the experiment stations, afforded means of utilizing the college farms. A few of the institutions are now carrying their farms only as areas for experiment. There are two kinds of investigational work on farms: One kind is studies and demonstration in farm practice; the other kind is research in the fundamental physical, chemical and biological problems, that must be conducted under conditions of direct control. Indoors, we have research laboratories and teaching laboratories; outdoors, there may be a similar separation.

We are now approaching the final and proper stage or idea,—that the ordinary college or university farm is a laboratory. The pattern farm, model farm, commercial farm, and illustration farm are all incidental and secondary to this general purpose. A college laboratory farm is not primarily for the growing of profitable or model crops. It is better to have the opportunity to teach one student by means of a farm than merely to show one hundred persons a field of perfect crops or animals. If principles of plowing are studied in the class-room, they must also be studied in the field, even if it is necessary to destroy a crop. If both ends cannot be attained, it is more important that a man learn how and why to plow than it is for the college farm merely to grow a good crop of wheat. Even if an instructor were obliged to tear up the drains on a farm in order to teach proper drainage of the land, he should have the privilege of doing so. Students will study real and live cattle, not pictures and models. They will endeavor to find out why cows are good or bad for this purpose or that. They will examine for conformation. These cows are as much laboratory material as the specimens of the botanist or the chemicals of the chemist. Live-stock must also be kept for the purpose of providing milk to be used in the dairy laboratory. The milk then becomes laboratory material, and the cows which produce it may also still be used for instruction purposes. It is asked whether college farms should not be used for the growing of maximum crops. In reply it should be said that a college farm is a means to an end: the end is the teaching of students; the growing of maximum crops may or may not be the best way of attaining this end. If such an area cannot be thought of as a farm, it may be called a field laboratory.

It will never be possible to systematize and to schedule laboratory work on a farm as explicitly as under cover, because of the uncertainties of weather and the distances involved. Therefore, indoor laboratory work will always be necessary in agricultural teaching; but the indoor work should be looked on as a supplement to the outdoor work.

If the land property of the college of agriculture is somewhat extensive beyond the requirements for experiment grounds and field laboratories of the kind suggested above, then some real farming may be done; and this is always desirable. It is particularly important that estate-farming, free from encroachment and with regular courses of crop rotations, be developed. Such an estate should be a continuing institution, and complete permanent records should be kept of it. This will afford the best basis for the study of farm management. If the college buildings are good and useful, the estate-farm should be still better and still more useful. It should be the most substantial part of the material equipment of the institution. This, too, will be a laboratory, but on a freer and more permanent plan than the usual college farms. This type of college farm, devoid of unsteadiness and change of purpose, is yet to develop in this country. It will be conditioned on long tenure of service and freedom of action of the officers in charge of it.

We may now consider the administration of a college farm. Formerly, the farm was in charge of the professor of agriculture; from him it naturally descended to the professor of agronomy, in case the old professorship were discontinued. It might just as logically, however, have gone to the professor of animal husbandry, dairy industry, horticulture, or otherwhere. But all departments in a college should have equal access to land, and to place the farm in one department—when the coördinate departments are several—is more or less to deprive other departments of the use of it. This traditional method of farm administration still prevails, however.

Two diverse modes of administering college farms, within the college organization, are now beginning to be tried. One mode gives to each department that wants it or needs it, a farm to itself, to do with as it chooses. Thus, the college domain may comprise a dairy farm, beef-cattle farm, pig farm, fruit farm, poultry farm. This is likely to result in inequality of management, but it stimulates every department to do its best and to develop itself to the farthest point. It does not allow of the estate-farming of which we have been speaking.

The other mode is to place the lands in the hands of the director, in order that all departments may have equal claim on the use of them as laboratories and as test grounds. This results in delegating them to a special officer or professor, as a professor of farm practice or of farm management. This is likely to solidify the work; but its success depends solely on the personality of the one in charge. This system easily lends itself to affording such students as have had no farm training an opportunity to acquire such practice under one officer, who is responsible for such student work, as another officer is responsible for botany or farm mechanics. In at least one institution, students are not allowed to graduate until they have had one year of farm practice. They are examined in this subject, as in any other. It is preferred that they have this practice before entering college; if they do not, they may acquire it on the college farm, but they receive no credit for it in hours: under this system, the farms are made directly useful to such students as most need them, and the farms are not overrun with students desiring to make college hours.

III. Short Courses

From the first, the schools and colleges of agriculture have provided abbreviated courses, that is, courses of less than four years and not leading to a degree. The reason for these courses arises from the desire of the college to aid the people, and also from the demand of the people that they be given advantage of the college without preparation and the sacrifice of time. Inasmuch as colleges of agriculture are state institutions and have had to prove themselves with the public, and as the public schools do not prepare for them, they have necessarily had to admit other than regular four-year students. These colleges are charged with the duty of making farms more productive and country life more desirable, as well as with the obligation of teaching students: their intention is, therefore, much unlike that of other colleges. These colleges are also obliged to contend with entrance requirements that may not be preparatory to their educational method. When the public schools prepare for other than arts-and-science colleges, the colleges of agriculture will be confronted with less obligation to accept students who do not have regular entrance requirements to offer; yet it is a significant fact that many of the persons who have no regular entrance requirements are as well able to handle the college work as those who do have them.

Special students.

Students who enter regular college work without the entrance requirements are usually known as "specials." A definite course of instruction may be provided for them, or they may be allowed to pick out such subjects as they desire and are qualified to undertake. Every effort should be taken to safeguard the regular courses by eliminating unworthy or doubtful special students. Inasmuch as the reason for admitting specials is to serve agricultural needs, only such candidates should be admitted as specials as are bona-fide farm persons or can give the best of evidence that they are preparing to be such. In no case, should a person be admitted as a special just because he fails to enter as a regular, unless the institution desires to maintain a preparatory department. It is better that specials do not receive formal certificates at the close of the period of study.

There are clearly two classes of persons who may be entitled to enter a high-class college of agriculture as specials: (1) farm youths who have had no opportunity to prepare for regular entrance, or who do not have the time or means to take a full course, and who desire to study as a means of general training; (2) maturer persons, sometimes college graduates, who desire to pursue some very special line of work for a time. The latter are the true specials, and to them the colleges of agriculture will always be open.

The former class (1) should decrease as the years go on: the schools will prepare them to enter; every year sees more accumulated wealth in farm homes; the needs and purposes of thorough education are coming to be more appreciated, as well among country people as among others. Persons send their youths to college in winter because they need them at home in summer; and they often expect them to cover the whole range of subjects in a twelve-month. The season when the youth is needed at home is likely to be the very time that he could best pursue his subject at college; but at present the year of the college of agriculture follows only the traditional college year, without reference to the course of nature. The time will come when the college year will be adapted to the subjects to be pursued; this will undoubtedly mean an all-year-round curriculum, with the student and the teacher allowed to choose his period. If the subject of agriculture is worth teaching at all, it is worth teaching in its entirety and throughout the year; and the patrons must be willing to give the time and the effort that are necessary both for good preparation and good subsequent study.

Winter-courses.

It is now the practice in most of the colleges of agriculture in the United States and Canada to give short courses in winter. They vary in length from one or two weeks—when they are essentially organized conventions—to three months, when courses may be given that cover a subject, when student sentiment may develop, and association-groups may be organized. Winter-courses have had tremendous effect on public sentiment touching the colleges, and they are accomplishing great good to agriculture. The better winter-courses are really setting new ideals and methods in education, by condensing the instruction, removing all unnecessary accessories and luggage, and pressing the work directly home. It is most astonishing what results can be secured in three months by an energized body of teachers who are willing to forget precedents.

The giving of winter-courses in so many of the colleges of agriculture is an illustration of the elasticity of these institutions and the facility with which they respond to the needs of the people. These courses are in great demand because they afford practically the only means now available whereby a farm boy or girl may receive quick instruction in agricultural matters. They are not of college grade. Some day the public schools will provide instruction of this kind. The time will probably never come, however, when the colleges of agriculture will be relieved of winter-course work. It is doubtful whether it would be to the advantage of the colleges to be relieved of it. The public and special schools will increasingly meet some of the demand; but there will always be great numbers of persons who will insist on going where the best equipment is and the most widely known men are; and they will covet the association with a college. With the development of proper secondary schools, however, the college will be in position to choose its winter-course students as it does four-year students; and the longer winter-courses will then become essentially short-term facilities for well-qualified specials.

Early experiments in winter-courses.

Many efforts were made in earlier times in the direction of popular and abbreviated courses. This effort found expression in the Ohio Agricultural College, established at Oberlin in 1854. In 1866, Yale offered a "shorter course in agriculture," with the following announcement: "For this course the instruction is so arranged that the more important topics, viz: Practical Agriculture, Agricultural Chemistry and Physiology, Agricultural Zoölogy, Physical Geography, Forestry, &c., are discussed during the fall and winter terms of each year (September to April, with vacation of two weeks at the holidays). Those who desire can thus attend, during seven months of the year, such a selection of the most useful exercises from the studies of the Full Course as will occupy their time profitably."

The Ohio State University at Columbus, made an effort in the winter of 1877-78 to interest farmers in a course of lectures. President Orton made the following reference to the subject in his annual report dated November 6, 1878: "An effort was made last winter to establish in the college a course of lectures on the sciences relating to agriculture for the benefit of the young farmers of the state who are unable to pursue an extended and regular course of study. The scheme proposed four lectures a day for ten weeks. It was to be illustrated and made as serviceable as possible by the use of the excellent facilities of the institution. No entrance examinations were required. The scheme was widely advertised, but there was no adequate response. Seven applicants appeared, but it was not deemed right to devote the necessary time and effort required for the lectures to so small a number."

The following winter (1878-1879) a more ambitious effort was made at Ohio, of four weeks' duration, and it met with success. This enterprise, however, was not so much a short course for students as a lecture course for farmers. Following is the scheme of this course:

LECTURES!

A Course of Lectures

on

AGRICULTURAL TOPICS,

will be opened on

Thursday, January 9th, 1879,

at the

OHIO STATE UNIVERSITY,

in

Columbus.

To continue Four Weeks,

Four Lectures Each Day for Five Days of the Week.

The Lectures will be Free, and no preliminary examinations or conditions will be required, except the observance of all rules designed for the maintenance of good order in the University.

Board may be obtained at the Boarding Hall at $3.50 to $4.00, in the City at $4.00 a Week.

The following Programme will be substantially followed:

President Orton, One Lecture a Week, or more.

1. Relations of Geology to Agriculture.
2. Soils of Ohio, No. 1.
3. Soils of Ohio, No. 2.
4. Water Suppiy of the State.

Prof. Norton, Two Lectures a Week.

1. The Atmosphere and Ventilation.
2. Water, Pure and Impure.
3. Combustion and Heating.
4. Fermentation.
5. Antiseptics and Disinfectants.
6. Preservation of Fruits, Meats, etc.
7. Food of Plants.
8. Food of Animals.

Prof. McFarland, Two Lectures a Week.

1. Plotting of Private Yards, Lawns, etc.
2. Plotting of Parks, Cemeteries, etc.
3. Measures and Measuring.
4. Levelling and Grading.
5. Land Surveying.
6. Road Making.
7. Sewers and Drainage.
8. Book-keeping for Farmers.

Prof. Townshend, One Lecture a Day.

1. Plants, and how they grow.
2. Wheat.
3. Corn.
4. Oats and Barley.
5. Root Crops.
6. Pastures.
7. Meadows.
8. Orchards.
9. Gardens.
10. Hedges.
11. Forests.
12. Horses.
13. Cattle.
14. Dairying.
15. Sheep and Wool.
16. Swine.
17. Drainage.
18. Farm Implements and Machinery.
19. Farm Buildings.
20. Manures.

Prof. Tuttle on Veterinary Anatomy, Physiology.
One Lecture Daily.

1. Animal Body, structure and functions.
2. Alimentary Canal, mouth and teeth.
3. " " gullet, stomach, etc.
4. " " intestines, mesenteric glands.
5. Food and Digestion.
6. Heart, Blood Vessels and Circulation.
7. Absorbents and Nutrition.
8. Lungs and Respiration.
9. Kidneys, Spleen, etc.
10. Skin and its appendages.
11. Reproduction.
12. Bones and Joints.
13. Muscles and their works.
14. Nervous System, Brain, etc.
15. " " Spinal Cord, Nerves, etc.
16. Senses of Sight and Hearing.
17. Senses of Taste, Smell, Touch.
18. External Parasites.
19. Internal Parasites.
20. Summary, Laws of Health, etc.

Prof. Townshend on Veterinary Surgery and Medicine.

One Lecture Every Day.

1. Symptons of Disease. Rational and Physical Diagnosis.
2. Causes of Disease.
3. Nature of Disease.
4. Classification of Diseases.
5. Principles of Treatment.
6. Remedial Agents.
7. " " continued.
8. Inflammation.
9. Inflammation of Lungs.
10. Inflammation of Stomach and Bowels.
11. Inflammation of Foot.
12. Inflammation of Joints.
13. Inflammation of the Eye.
14. Hog Cholera.
15. Texas Fever.
16. Foot Rot.
17. Difficult Partnrition.
18. Poisons.
19. Wounds.
20. Operations.

In the annual reports of the following November (1879), Professor N. S. Townshend wrote as follows:

"To make the State University more immediately serviceable to the agricultural interest of the state, the Board of Trustees determined to provide a course of free lectures on topics of practical interest to farmers. These lectures were given by the professors of the University beginning January 9, and continued four weeks—four or more lectures each day. The experiment was a decided success; the total number of farmers in attendance exceeded one hundred, and the regular daily attendance was upwards of fifty.

"At the close of this course of lectures, those who had attended formally and unanimously expressed their satisfaction with the course of instruction, and united in a request that a similar course should be given at the University in January, 1880."

This course of lectures was not long continued.

The short course in agriculture at the University of Wisconsin, opened the first of January, 1886, and continued twelve weeks with an attendance of nineteen pupils. This is undoubtedly the oldest short course of the kind now practiced and that has continued with increasing attendance. In 1890 there was added a course in dairying, which was practically a short course in that subject and a branch of the regular short course. Two students registered that year and seventy the next. It soon gained great headway.

Differentiation in winter-courses.

Winter-courses have broken into subject-matter divisions in some of the institutions, as in dairying, horticulture, poultry, stock-judging and home economics. There is also a tendency to grade or divide them in such a way that the student may attend more than one winter, one course being a preparation or foundation for another; this is a great advance, as it looks in the direction of special training.

Teachers' schools.

Some of the colleges of agriculture are now holding summer schools or sessions for teachers. The vacation school probably affords the best means of aiding the teacher who cannot take a year or more for preparation. These schools are of two orders: those connected with an institution; those held by state departments of education, being in the nature of prolonged and specialized institutes. If a person devotes himself to mathematics, language, literature or science in a good summer school of six weeks' duration connected with an institution, he is able to receive a year's college credit for it; there is no reason why he should not cover similar ground in agriculture, if the subject is well taught. The summer schools are becoming more and more explicit and concrete. When they are held at an established institution, they have the advantage of the facilities that have been collected through years of effort. They are also dominated by the teaching spirit, as most of the students are themselves teachers. For agriculture teaching, these schools may be very effective because they come at a season when crops are growing. It will not be long before all agricultural colleges will offer such work. This summer-school work in agriculture is coming to be very direct and practical. In some cases, the school is held in spring rather than in summer.

Other short courses.

Other kinds of short courses may be expected to develop as demands arise. These may be expected particularly in summer, for students in agriculture as well as for teachers. Summer facilities need to be provided in the best equipped colleges for the teachers and experimenters who would spend a vacation in taking advanced courses of study. Summer work of this nature will raise the question of an all-year-round curriculum (page 445).

IV. POST-GRADUATE WORK

Graduate study in agriculture is necessarily of late development, because until recently agricultural knowledge has not been educationalized and because recognized standards for post-graduate work of any kind have not yet been developed as they have for under-graduate work. Post-graduate degrees have been given for many years by some colleges of agriculture, but to a large extent they have been complimentary rather than earned as the result of definite after-graduate study. It is important that we distinguish sharply between these classes.

We may distinguish four realms of education: The primary and secondary, comprising the public school region; the college and university, comprising the academic region. The university or post-graduate realm lies beyond the college proper.

Graduate work is the normal and natural activity of a university. It should be distinguished from college work. If the graduate work represents a grade or epoch above the college work, it thereby becomes part of a regular system and establishes standards. It must have much the same effect on college work as college work has on high-school work. It tends to systematize all educational effort; it establishes relationships as between the different phases of educational work. American universities, as a whole, have not properly estimated the value of post-graduate work as a regular part of a pedagogical system.

The experiment stations have greatly stimulated post-graduate study, not only in agriculture but in all subjects. They are essentially endowed research departments in the colleges of agriculture. They are also demanding for officers, men who have had more than undergraduate training. To a very important extent, they are setting standards in the higher agricultural education.

Nature of post-graduate work.

We must clearly distinguish the functions in the different realms. In the public school, the pupil is given a general education; in the college, the student pursues a group education; in university or post-graduate work, he specializes. The completion of the public school region in this country is signalized by a diploma; of the college realm by a baccalaureate or first degree; of the university realm by a master's or doctor's degree.

When the student passes beyond the college phase, he ceases his group work or class work, and proceeds by himself. He engages in personal work. Such work must be pursued largely alone, with the minimum of the ordinary teacher's helps. It should be really post-graduate, lying beyond the college realm. It should not be merely additional undergraduate work, as is often the case.

It is now becoming necessary to select the men who are to engage in post-graduate work. We should not start with the assumption that any man who has the technical or formal baccalaureate requirements may, therefore, take a post-graduate degree. He may not have a post-graduate mind. Degrees are not compliments. Many students remain to take post-graduate degrees merely because they have nothing else to do, or because they are waiting for a job. A person is not entitled to a post-graduate diploma merely because he has completed work and residence for a degree: he should submit his work to careful judges, and the work should be weighed. It is well to emphasize the selective process in education. It is true that all persons should be sent to school, but how long they should remain in school must depend largely on the person. Some would better not go to high school. Many would better not go to college. Most would better not ask for a masterate. Now and then one may apply for a doctorate. Beyond the doctorate lies the realm of compliment, or of honorary degrees, to which rules and standards do not apply.

No institution should accept a candidate for post-graduate work unless it has thoroughly qualified officers and highly satisfactory facilities.

It is necessary to make the post-graduate work dynamic. One may study so long as to get out of touch with the activities of life. One result of our general educational system is to make the student passive. We do not train for leadership. Students do not seem to have the power to apply themselves to the problems of life when they go home. The colleges of agriculture are trying to change all this, and it is quite as necessary to carry this spirit through the post-graduate work as through the undergraduate work. We must challenge the idea that we need to train men merely to be able to think and to ponder. Usually the person who goes off by himself to think goes off to sleep. He thinks best who works best.

Advanced degrees.

Degrees were at first licences to teach. A bachelor was one in training for a teacher's degree. The bachelor did not at first receive a degree; and there is now no bachelor degree in Germany. A master is literally a chief, leader, teacher. A doctor, as the word means, is a teacher. The original degrees (dating from the twelfth century) were the master's and doctor's. The name of the faculty came to be associated with the degree, as *Artium Magister*, Master of Arts; *Medicinæ Doctor*, Doctor of Medicine; *Juris Doctor*, Doctor of Law; *Philosophiæ Doctor*, Doctor of Philosophy. The early universities gave licenses to teach the civil law. Eventually the canon law was recognized; and a record of this duality is preserved to us in the German degree J. U. D. (*Juris Utriusque Doctor*), or "doctor of both laws;" and also in the familiar LL.D. (*Legum Doctor*), or "doctor of laws," the double L being a method in Latin of indicating a plural.

As professional education developed, special baccalaureate degrees were given, as, C.E., Civil Engineer; D.V.M., Doctor of Veterinary Medicine; M.E., Mechanical Engineer. The faculties of arts colleges and universities became more or less divided into the groups of Arts and of Sciences, and corresponding degrees were given, as, A.B. (*Artium Baccalaureus*), Bachelor of Arts, and B.S., Bachelor of Science. The same division was carried into the master's work, in the degrees M.A., and M.S.; and in the doctorate the division is sometimes represented by D.S. or D.Sc., Doctor of Science, in distinction from the general Ph.D.

It is no doubt wise and expedient to recognize these two lines of study – the arts and the sciences. We must, necessarily, also retain the professional degrees that have historic value. It is very doubtful, however, whether occupation should be expressed in academic degrees. Such degrees have another purpose. They indicate the completion of a course or line of study, and not what a person is to do in the world. It is not the primary concern of an educational institution to emphasize vocation, but to educate men and women, even though it accomplishes this end by using the vocation as a means.

The general tendency in American colleges of agriculture is to give the Bachelor of Science degree, indicating that the student has completed a science course. Of forty-two of the institutions giving agricultural work, twenty-nine award the

Plate XX. Irrigation farming. Farm scenes in western Colorado

degree of B.S.; eleven, the degree of B.S.A. (in three of which the degree is written Bachelor of Scientific Agriculture; in eight, Bachelor of Science in Agriculture), and two, the degree of B.Agr., Bachelor of Agriculture. Formerly, the degree of B.Agr. was more frequent; but, as instruction in agriculture has risen in grade, it has tended to range itself with recognized science work. The straight B.S. will probably be given in the future.

If agriculture desires to be recognized in academic circles, it would better try to earn the established degrees and standards rather than to make new standards of its own. New standards have no value until they have been earned and recognized. Agriculture must attain to the standards set by educated men. It cannot honor itself by establishing separate marks for itself: it must be honored by other men, rather than by itself. Its students must aim to become members of the great fellowship of educated men, and to be worthy the marks that long custom has established for such men. It should not isolate itself. All unusual and odd occupational degrees should be avoided. It is to be remembered that degrees are academic marks or insignia; if it is thought to be desirable to have special marks of eminence for men because they are agriculturists, then we may well look for such marks to be given by societies or organizations other than colleges and universities.

The master's degree may well stand chiefly for investigation and the accumulation of facts. It may represent technical work. The regular and recognized degrees are M. A. and M. S. When one comes to the doctorate, however, he should begin a philosophical study, weighing, comparing and monographing his accumulated knowledge, and bringing it to a systematic termination, with deduction of laws. The doctor's thesis should be good enough to be printed and published. This work, if worthy, should bring the candidate the degree of Ph. D.

The master's degree and the Doctor of Philosophy should be earned. They should stand for an epoch of study. There should not be two earned doctor's degrees for general academic work. When a person comes into the region of the doctorate, he enters into the democracy of letters and he has left behind him the route by which he came.

The proper honorary degree in this country is LL.D. This may be given to any man who is considered to be worthy of it, whether he is a college man or not, and whatever his vocation. It is given him not because of his occupation or profession, but because of himself. While the master's degree and the Doctor of Philosophy should be earned, it is nevertheless a question whether there may not be exceptions now and then; but the recognized honorary degree should be Doctor of Laws. The practice of giving baccalaureate degrees as compliments is much to be discouraged.

Since there is no uniformity of practice in the giving of second and third degrees, it follows that such degrees may be worth very much or very little, depending on the institution that bestows them. Undoubtedly they have been bestowed with too little discrimination, but the present tendency is toward greater care to uphold the meaning of post-graduate work.

V. Extension Work

The most noteworthy recent development in agricultural college effort is the growth of the extension idea. Extension work comprises all those activities that are not of academic kind and that aim to reach the people and their problems in the places where the problems are. It is conducted mostly away from the institution. It differs from the regular forms of university extension in its purpose to aid the person at home with his special questions, one person at a time.

The adding of extension work still further expands and complicates the activities of a college of agriculture. Some persons feel that these colleges are essentially hybrid or mixed in their work, inasmuch as their activities range from elementary education to research work, and that they are in danger of becoming confused in their efforts. The necessity is on these institutions, however, to do this range of work. They must train practical farmers, investigators and teachers, aid the man and the woman on their farm and the tradesman who deals with farm products, and discover truth. If this is what they must do to serve mankind, it is incumbent on them to do it the best they can and without too much concern for college traditions.

It is to be hoped that some of the work that these colleges now do will not be required of them in the future; but there will be no need to fear confusion of work if the different kinds of effort are clearly understood, properly separated, and effectively officered. The management of a college of agriculture can hold to the highest kind of course work, the most thorough-going research, and at the same time be an ardent supporter of propagandic work with the people. There is no real reason why all these activities should not proceed simultaneously in the same institution. They are not antipodal, but are really coördinative. In fact, they are the very things that should make an institution democratic and most useful.

The extension work should be recognized as a necessary part of any college of agriculture, coördinate with academic teaching and experiment station effort. It should command the services of as good men. These men should be trained for this kind of effort as other men are trained for their departments; the extension effort is certain to be immensely important; and its importance will never decrease, although the kind of work will change from epoch to epoch.

The extension enterprises of the colleges of agriculture are but part of a larger humanitarian and brotherhood movement. These enterprises should articulate with similar work of other educational institutions, boards of many kinds, the departments of government, and numbers of societies and movements in country and town. The college of agriculture stands for the rural side of all this effort, and thereby it is brought into first-class relation with the large public work of the day.

The extension department affords a college the necessary means of publicity, providing the ways of disseminating the information secured in its research department and of teaching the people who cannot go to college. All the farmers of a commonwealth are properly students of the state college of agriculture: it is the office of the extension department to see that they are enrolled. A good part of the extension work is an expanding of the experiment-station side, as in the many kinds of experiments and surveys that are made in the localities, and in the popular publication of experiment station results.

Origin of the extension movement.

It would be impossible to state where or when extension work in agriculture first began. The propaganda of the early societies was largely of this kind. The very earliest colleges and schools of agriculture sought, as much as they could, to aid the man on his own land. The Land-Grant colleges began in the early seventies to send officers out to speak and to hold meetings. As an organized office or department of a college of agriculture, however, the extension work is a growth of the past ten years; and there are few such departments at the present time. Probably the first state enactment appropriating money directly for this kind of popular work, and which resulted in a real extension effort, was that passed by the legislature of New York early in 1894. This act was largely the suggestion of John W. Spencer, Westfield, Chautauqua county, and the late E. G. Lodeman, instructor in horticulture in Cornell University. Its passage was secured by Hon. S. F. Nixon, member of Assembly from Chautauqua county, and subsequently speaker of the Assembly. The act was popularly known as the "Experiment Station Extension Bill" or Nixon Bill. Appropriations increased and in 1899 the law was modified to include more specifically the giving of instruction, a work that had grown up under the earlier bill; and it then became known as the "bill for the promotion of agriculture." This law continued in force till 1906, when the administration law of the New York State College of Agriculture was enacted. The nature-study leaflets—perhaps the first recognized extension publications of the colleges of agriculture—began issuing in December, 1896.

It is only a question of time when the national government will come to the support of extension work, as it has already endowed the academic and research sides of the institutions.

Kinds of extension work.

Every department of a college should have an extension phase. Preferably every department should have an extension officer (page 435), who is responsible to the head of the department for the accuracy of his subject-matter. The college may then have a separate officer, office or department that organizes all the extension interests of the institution. It would be possible, therefore, to make a catalogue of extension work by naming the departments of the college. Aside from this, there would be certain separate organized extension agencies.

For our present purpose, we may name the following series of extension enterprises, which, however, do not exhaust the kinds:

(1) *Personal acquaintanceship* and visits with farmers.

(2) *Correspondence*, the more personal the better.

(3) *Publication*, in all the departments of the work.

(4) *Lectures and itinerant schools.*—From the extension department of a college of agriculture should proceed lectures, institutes, conventions, and traveling schools, that carry the educational impulse and the latest knowledge to the people, all in charge of persons who are specially trained for the work. The demand on teachers and experimenters for such work as this consumes much of their energy, makes serious inroads on time that is supposed to be devoted to other purposes, and often sacrifices the interests of students. On the other hand, a college of agriculture cannot withdraw from the people and still be able to serve them. The traveling-lecture work belongs to the extension department rather than to the academic department. When specially trained men are provided, the demand on other teachers and on experimenters will not be felt seriously.

Farmer's institutes belong in this category; and these we shall discuss separately (page 460).

"Farm trains" are also of this group. These are schools taken from place to place in railway cars. They have been specially successful in Canada in dairy work, and also in the central west.

The "farmer's week" enterprise, now well established at some of the colleges, is another expression of this kind of work.

(5) *Coöperation with organizations.*—Every organized agricultural interest should contribute to the general welfare in an educational way. Without in the least interfering with any organized effort (but rather aiding it), the college of agriculture can be useful in coöperation. The college should have relation with every agricultural society and club, that it may study the educational features and spread them. The fairs are, or should be, educational institutions. The college should coöperate with them. The rural churches and the colleges of agriculture also should coöperate in many ways. Village improvement societies, women's clubs in villages and the open country, experiment clubs, and other organized bodies are all within the field of a college extension department. A very fruitful kind of coöperation may be had with the Young Men's Christian Association and other altruistic bodies.

(6) *Organization of extension interests.*—A natural consequence of extension work will be some kind of an organization of the participants to concrete and forward it. In several states and in the province of Ontario, organizations have already been perfected, but, so far, they devote themselves mostly to experiment work and are "Experiment

Unions," "Experiment Leagues," and so on. They are gradually enlarging their scope.

(7) *Extension work by students.*—Certain kinds of helpfulness can be carried into various parts of the state by students, particularly in the organizing of societies, reading-clubs, holding of meetings, and the like. Students may constitute very good advance agents if they are carefully chosen and are well guided, engaging in a very necessary kind of "neighborhood work." In one or two of the American colleges, this enterprise of students is a part of a regular college course of instruction that is designed to train young men and women to be speakers and community workers (page 437).

(8) *Boys' and girls' clubs.*—The organizing of boys and girls into clubs of one kind and another, under the stimulus of the college of agriculture, is now well under way in some of the states. This club may be a domestic science effort, a crop-growing effort, or a nature-study school effort. Such clubs can be made to be powerful agents in opening the mind to the advantages and possibilities of country life.

(9) *School work.*—The rural schools must look largely to the colleges of agriculture for help and guidance. The education department of such a college should have its extension bureau. In fact, the greatest problem in extension work at present is with the public schools. It is largely this propaganda that has brought about the present demand for vital work in the country schools. Now that state departments of education are publishing syllabi for agriculture, it specially devolves on the colleges to help in working them out.

(10) *Reading-courses.*—The chief object of a reading-course is to develop and then to satisfy the reading habit.

The correspondence-course, as the term is commonly understood, is a form of reading-course for the few persons who desire to read books or engage in steady home study.

We shall discuss the reading-course idea separately (page 457).

(11) *Surveys,* or exploration to discover local fact. To these we shall recur (page 453).

(12) *Experiments and demonstrations on farms.*—It is now an accepted part of the work of an agricultural college to make demonstrations and tests on farms and in gardens. This kind of teaching provides laboratory work for the farmer on his own farm. There are three purposes in this extension experiment work: (1) To illustrate or teach,—to instruct the coöperator in methods, to set him at the working out of his own problems, to bring him into touch with the latest discoveries and points of view. (2) To demonstrate or determine in various parts of the state the value or the inefficiency of various new theories and discoveries,—to determine how far these newer ideas are applicable to local conditions. (3) To discover new truth, which may be worthy of record in bulletins: this is usually the least of the results that follow from such experiments, because the experiments are not under perfect control nor continuously under the eye of a trained observer. In making these remarks, regular experiment plots on land rented, owned or controlled by a college or station at places about the state, are not under consideration: these are essentially branch or local experiment stations rather than outright teaching enterprises.

(13) *Tests and inspections.*—Various kinds of tests and inspections fall to the colleges of agriculture. One of the leading groups is the testing of milk for butter-fat in order to determine whether the cow is entitled to be recorded in the official advanced registry of the breed. These tests are paid for by the breeders, or their associations, but the work is performed by persons employed by a college of agriculture or by an experiment station. Departments of dairy industry endeavor to come in close contact with butter-makers, cheese-makers, milk-shippers, and milk-producers. Some of the colleges employ one or more officers to visit persons engaged in dairy work, showing them where improvements may be made and frequently remaining with them long enough to put the suggestions into practical operation. The kinds of inspection work are numerous, reaching to every farming interest.

(14) *Inquiries in economic and social questions.*—A natural corollary of an academic department of rural economy are methodical studies of the actual economic status of agriculture in the state and the social status of the agriculturist. This study may be prosecuted by personal work, or "surveys" in the field, and also by skillful use of the mailing-lists. A mailing-list should be more than a lot of names to which publications are to be sent. Every person who is the recipient of the publications of a college of agriculture should be willing to give personal information that the college may use in studies of the agricultural status. A mailing-list, in other words, should carry certain specific information.

(15) *Local agents.*—In time, the college of agriculture will have a resident agent in every agricultural county in its state, or in smaller areas, to act as its local extension officer and representative, and to keep the college apprised of the needs of the communities. In Ontario, a marked beginning has been made in this direction; and lesser ones elsewhere. The former students of the colleges will make proper agents, as soon as they are officially recognized as such. The agent should have a regular office, be available for organization work, aid in school teaching and farming, and should anticipate, so far as possible, the probable difficulties and problems of any season in order that he may inform the college and possibly provide relief. He should stand as a neighborly advisor, and be ready to aid the community in any good work.

Winter-courses are sometimes classed as extension work. If they are merely extended conventions, they may be as much extension enterprises as "farmers' weeks," or other meetings. If they are of long enough duration to develop the study spirit, it is doubtful whether they should be so classified; they then stand between extension work and regular college work.

VI. Student Coöperation in Colleges of Agriculture

The colleges of agriculture are state institutions; their purpose is to reach all country people. The country population is unstratified; all persons meet on terms of equality. It is natural, therefore, that the student body of a college of agriculture should be freely democratic. It is characterized by marked free-masonry and college spirit. It is easy to organize such a body into a coöperative force, that will greatly aid in the administration of the institution. A college of agriculture should be looked on as a membership association, the students being as much members as the staff, and contributing their part to the management. A college fails of its highest usefulness if this spirit is not a part of it.

The student members become interested in the mission and the propaganda of the college. They may coöperate in the forwarding of all extension work, as in reading-courses, public meetings in the country, organizations of country people. To them should be given a great part of the control of excursionists and of meetings at the college; and they should be consulted when important changes of policy are under consideration.

The government of the college should be in the students' hands, not so much in the form of organization for this particular purpose as in the feeling of co-partnership that should exist among them. Good government is the natural result of good and interesting work on the part of students. It should not be necessary to organize a student's government association, but only to provide machinery to deal with occasional offenders.

Association-groups.

Students should be encouraged to meet to talk over the work that they are doing. This will bring persons of similar tastes together, and an informal club or friendship-group results. In a highly differentiated college, there will be many of these groups, each crystallizing naturally about a subject or a piece of work, particularly if the administration of the institution encourages such effort. There will be a group in plant-breeding, animal-breeding, fruit-growing, entomology, dairying, rural engineering, botany, home economics, and so on and on.

A member of the staff may be the nucleus of each group. All these groups will soon find themselves represented in a general agricultural association; and this association should be practically the college itself. Through such groups and associations, student sentiment grows and crystallizes, and expresses itself to the staff of the institution. The whole college becomes a social organism, with its foundations resting on real and native interests rather than on the customary and often meaningless society motives that move most of the people. The results run into every class-room, and even color the mode of instruction.

This sketch is not an imaginary picture. These things are now being worked out. The final result is going to be a kind of coöperative teaching that we little realize today.

Continuing studentship.

When the student returns to his farm, he becomes a local agent (page 451) for the college. In the future, he will be the organizer in the localities of agencies for the public good.

This is to say, the impetus of a college training ought to be with the student through life. Studentship should never cease. The college course is only an epoch in the continuing education. The student takes up new activities on leaving college, but he should still be a college man in spirit. If he is under obligation to coöperate with his fellows when he is in college, he is equally under obligation to do so when he enters into the larger affairs of life; and this obligation is the greater if he has received his start and momentum at the expense of the state, as in the public schools and State College. Similarly, the obligation of the college to the student should not cease: the institution should endeavor to keep in touch with its old students, preferably by means of some kind of organized effort. The point is, that the college association, in its highest expression, is a life relationship rather than an incidental college-course connection.

Student journalism

The student press of the country is beginning to assume more than academic importance. It is beginning to reach beyond the institution. In most colleges or universities of all kinds, the students publish one or more periodicals. Some of them are newspapers. Some of them are technical journals of merit.

Students in colleges of agriculture are now publishing agricultural journals. These journals represent the college man's point of view on farming and country life. They are little known at present, but they are undoubtedly the beginning of a new type of journalism. There are now about twenty-five agricultural student journals in Canada and the United States; following is a list (Cf. also list of journals, pages 80–87). Following is the list, probably complete, of such journals as are really agricultural (date of establishment is indicated):

Agricultual Student. Published by the Agricultural Society of Ohio State University. *M.* 50 cents. 1894. Columbus, Ohio.

Agriculture. Association of Agricultural Students of the University of Nebraska. *M.* $1. 1902. Lincoln, Neb.

C. A. C. Lookout. Students of Connecticut Agricultural College. *M.* (9 issues.) $1. 1904. Storrs, Conn.

Cornell Countryman. Published by Association of students New York State College of Agriculture. *M.* (9 issues.) $1. 1902. Ithaca, N. Y.

Demeter. The Agricultural and Sugar Clubs of the Louisiana State University and Agricultural and Mechanical College. *M.* $1. 1902. Baton Rouge, La.

Exponent. Students of the Montana Agricultural College. *M.* 50 cents. 1896. Bozeman, Mon.

Farm Students' Review. Minnesota School of Agriculture. *M.* 40 cents. 1882. Minneapolis, Minn.

Georgia Agricultural Quarterly. University Agricultural Club, State College of Agriculture. *B-M.* 50 cents. 1908. Athens, Ga.

Idaho Student Farmer. Agricultural Club, University of Idaho. *Q.* 50 cents. 1908. Moscow, Idaho.
Illinois Agriculturist. Agricultural Club, University of Illinois. *M.* 50 cents. 1896. Arbana, Ill.
Iowa Agriculturist. Agricultural Club of Iowa State College. *M.* (10 issues.) 50 cents. 1901. Ames, Iowa.
Kansas Agricultural Review. Students of State Agricultural College. *M.* 50 cents. 1903. Manhattan, Kansas.
Missouri Agricultural College Farmer. Published by the Students. *M.* 50 cents. 1904. Columbia, Mo.
North Carolina Student Farmer. Rural Science Club of the North Carolina College of Agriculture and Mechanic Arts. *M.* (except July and August). 50 cents. 1908. West Raleigh, N. C.
O. A. C. Review. Students of the Ontario Agricultural College. *M.* $1. 1888. Guelph, Ont.
Oregon Countryman. Agricultural and Domestic Science and Arts Students., Oregon Agricultural College. *M.* (except July, August, Sept.). $1. 1908. Corvallis, Oregon.
Penn State Farmer. Agricultural Society of the Pennsylvania State College. *M.* 50 cents. 1908. State College, Pennsylvania.
Purdue Agriculturist. Agricultural Students of Purdue University. *M.* 50 cents. 1906. Lafayette, Ind.
Student Farmer. Students of College of Agriculture, University of Wisconsin. *M.* 50 cents. 1907. Madison, Wis.
U. T. Farmer. Agricultural Club, University of Tennessee. *M.* $1. 1906. Knoxville, Tenn.
V. P. I. Agricultural Journal. Agricultural Club, Virginia Polytechnic Institute. *B-M.* 50 cents. 1906. Blacksburg, Virginia.
Washington Agriculturist. Students of Agriculture in Washington State College. *M.* 50 cents. 1908. Pullman, Wash.

This class of agricultural periodicals is now assuming considerable age, as may be seen from the following statement of the number of the yearly volume in which some of them are now publishing:

The O. A. C. Review. Ontario Agricultural College. Twentieth volume.
The Agricultural Student. Ohio State University. Fourteenth volume.
The Exponent. Montana Agricultural College. Twelfth volume.
The Illinois Agriculturist. Illinois State University. Twelfth volume.
The Iowa Agriculturist. Iowa State University. Eighth volume.
Agriculture. University of Nebraska. Eighth volume.
The Cornell Countryman. Cornell University. Sixth volume.
Missouri Agricultural College Farmer. Fifth volume.
Demeter. Louisiana State University. Sixth volume.

The journal of Farmers' College (page 374), probably the first American college agricultural periodical, was published by the faculty of the institution.

VII. Agricultural Surveys

From the earliest days of activity in agricultural betterment, surveys or censuses of conditions in rural communities have been prominent. [See Washington, page 88; Delafield, page 392; Hilgard, page 409; and page 526, Vol. I.] These early efforts are not enough considered by the present workers. There is now a recrudescence of the idea, modified by the more exact inquiries that we are able to make at the present day. Practically all of the colleges of agriculture are making surveys of agricultural conditions and industries of one kind and another, and some of them have perfected regular organizations for the work, sending parties into the field for the special purpose of studying the soils, fruits, milk-supplies and other things.

It is incumbent on every state to make a thorough investigation of its resources and a study of its status, and the agricultural resources and conditions must be included with the rest. Whether the state government should do the work, or whether it should be commissioned to the college of agriculture, is a detail to be worked out in each state for itself; but the work should be done only by experts and these men, in the states, are now mostly connected with the colleges and stations. At present, the survey inquiry is developing, in the states, as a part of the extension work of the college.

Much of this kind of inquiry is made by the United States Department of Agriculture in very many lines of effort; and the work is growing rapidly.

The writer's point of view on local studies of all rural conditions is stated as follows in "The State and the Farmer:"

"Such an inquiry, made carefully and without haste, by men who are thoroughly well prepared, and continuing over a series of years, would give us the data for all future work with local problems. We must have the geographical facts. We are now lacking them. We talk largely at random. We must discover the factors that determine the production of crops and animals in the localities, and the conditions that underlie and control the farm life. A study of these conditions involves a study of local climate; knowledge of the kinds, classification and distribution of the soils and the relation of place and altitude to production of crops and live-stock; determination of the best drainage practices on various soil types; consideration of the cultural experience and manurial needs, as adapted to the types; inquiry into the practice with all leading crops and products of the localities; study of the possibilities for farm water-power; collation of community experience. Such a survey of a state should be broad and general enough to consider the status of all the agricultural industries in the state, and it should also take full cognizance of educational and social conditions.

"This constitutes the greatest need of practical farming at the present day. The agricultural institutions are working out the principles, but they may not be able to apply these principles to individual farms because they do not know the exact local conditions. The farmer himself may not know the principles, nor even the local facts. The result is a lack of articulation between the teaching and the practice. Farming is founded on the facts of the locality: no business can hope for the best success until it has exact knowledge of its underlying conditions.

"These kinds of inquiries are now well under way, in the form of 'surveys' of many kinds, proceeding from the colleges of agriculture and the United States Department of Agriculture. The studies of larger range, that purpose to compare general conditions in the whole national domain and to standardize our knowledge of them, may well be undertaken directly by the national government; but the commonwealth itself should give itself the advantage of making surveys in the greater number of the agricultural conditions. The survey work of the institutions will be greatly perfected in the next few years, and we may expect to see great public funds devoted to it. The survey parties will comprise strong, all-round men. No small part of the value of such surveys will be the discovery of great numbers of earnest, competent men and women on the farms who may be made local leaders, and the recognition that it will give to good agricultural practice everywhere. Every thorough survey should be the forerunner of new ideals for the communities, and of new points of crystallization of local effort. It should make new paths."

A commonwealth may be conceived of as a great business or commercial corporation. The commonwealth cannot do business efficiently without an inventory of its assets. The geological and natural history surveys and the censuses have been of this nature, but we now need to go much further and to make direct application to the fundamental economic betterment of the commonwealth. The assets in timber, ores, water-supplies, climate, soils, crops, animals, agricultural business, should all be as carefully discovered and recorded as those of population and insurance and banking departments. The agricultural survey, therefore, becomes one part of a continuing state effort, and the entire effort should work together to one end. It will be seen, then, how inadequate even the best of our agricultural surveys yet are.

Kinds of surveys.

The search for local fact may be in any one of very many phases of country life. A field inquiry may be made into the apple business of a county or region; into the truck-gardening business; the alfalfa-growing; the wheat-growing; the poultry-raising; the milk-production; the beef-cattle or the mutton business. It may be an investigation of the soils of the region; and it is always well to start this first and to make it the basis for future inquiries into the crop-growing and animal-production. The soil survey, in turn, should be correlated with a previous thorough-going geological and topographical charting of the region. The inquiry may take the form of a search for the social and educational bases of the communities, as the character of schools, churches, literary societies, and so on.

In other cases, the census may be of the farm-management kind, setting out to determine how in general the farms of a region are managed, and what results they give. This kind of survey will require the collecting of much information on blanks, that it may later be tabulated and compared. This information may be secured from a few picked farms by means of correspondence; but if the local facts of a region are wanted, every farm in the region should be visited by skilled men who will secure the information first hand, verify it by collateral evidence, and make personal estimate of the farmer. Following are blanks that have developed at Cornell University, after some years of experience, for a general farm survey of one of the counties (these are of filing size—about 5 x 8 inches—and are attached to stubs, the whole being assembled between covers). The following set is for farms owned by the operator; other blanks are used for farms operated by tenant:

NEW YORK STATE COLLEGE OF AGRICULTURE, CORNELL UNIVERSITY, ITHACA, NEW YORK.

No. 1 Date ______ 1908

Owner ______ (______)* ______ years. Postoffice address ______ Age ______

Location ______ Miles to market ______ to railroad ______

Miles to haul milk ______ hours per day ______ trips per day ______ per week ______

Condition of public and private roads ______

Distance from barns to fields ______ to pasture ______

Total area of farm ______ Acres permanent pasture ______ Acres in timber ______

Waste land, including roads, streams, etc. ______ Acres tillable ______

Drainage ______ Soil types ______

Topography ______

Chief products sold ______ Most profitable ______

*Space left for officer's personal check on the owner.

Crops Raised and Sold During 1907. No. 2

Crop		Yield		Sales			
Kind	Acres	Per acre	Total	Amount sold	Price	Value	
Corn for grain .							
Corn for silage .							
Wheat							
Oats							
Barley							
Rye							
Rye-straw . . .							
Buckwheat . . .							
Hay							
Potatoes . . .							
Beans							
Cabbage							
Apples							
Lumber							
Wood							
Posts							
Other crops . .							
Total . . .							

Acres permanent pasture________ Acres not permanent________ Months used________ Number of stock pastured, cows________, horses________, sheep________.

No. 3

Animals		April 1, 1907			April 1, 1908			Sales 1907			Purchases 1907			Died
Kind	Breed	No.	Value	Total	No.	Value	Total	No.	Price	Total	No.	Price	Total	No.
Cows														
Heifers														
Calves														
Bulls														
Steers														
Horses														
Colts														
Sheep														
Lambs														
Chickens														
Hogs														
Pigs														
Bees														
Other animals														
Totals														

No. 4, continued

Products	Amount	Price	Value	Products	Amount	Price	Value
Butter				Eggs			
Creamery milk				Wool			
Market milk				Other products			
Honey				Total			

No. 4

Capital	April 1, 1907	April 1, 1908
Real estate		
Buildings, etc.		
Machinery and tools		
Live-stock		
Grain and other feed		
Hay and produce not feed		
Cash to run farm		
Total		

Average ____________

Increase ____________ Decrease ____________

Increase or decrease in value of farm ____________

Increase or decrease in fertility ____________

Relative food per cow and sheep ____________

Relative food per horse and cow ____________

What accounts are kept ____________

Number in family ____________

Over 16 years ____________

Expenditures	April 1, 1907 to April 1, 1908
Labor actually paid	
Board of paid laborers, estimated	
Seeds—clover, timothy, etc.	
Feed—hay, ______ tons	
Other feeds ______ tons	
Fertilizers	
Machinery and repairs	
Buildings and repairs	
Fences and repairs	
Horseshoeing	
Threshing	
Silo filling	
Binder twine	
Taxes	
Insurance	
Miscellaneous	
Total cash expense	
Estimated labor of family not including farmer's labor	
Farmer's labor, time ______ value	
Total	
Receipts for labor	

GENERAL NOTES. No. 5

Rotation followed ____________

How long is land in hay? ____________

Management of manure ____________

Highest schools attended by farmer ____________

Farmer's financial history ____________

General Notes, continued

Condition of church ____ Suggestions for improvement ____

____

Condition of schools ____ Suggestions for improvement ____

____

Are farm buildings in good repair? ____ Are they adequate ____

General appearance of farm ____

Sanitary condition of farmstead ____ Dairy ____

Is there rural free delivery? ____ Telephone? ____

Suggestions for improvement ____

____

____

____ Recorded by ____

VIII. Extension of the Reading Habit

The farmer thinks in terms of experience rather than in terms of books. Until very recent years, there have been few good books that attack his problems from his point of view. It is not strange that he should not have depended on books; it is better that he should not have done so. All conditions are now changed, however. All persons may find specific help in books. Farm experience is being put into print, and the farmer who would make his way in the years to come must read these prints. A reading habit must be developed.

Reading-courses.

The experiment station lists show that the ordinary bulletins are not inculcating this habit rapidly, yet there is a widespread demand for readable reading matter along specific lines, which is not well met by any existing agency. There have now come into existence farmers' reading-courses, as a part of extension teaching.

The objects of a reading-course are three: To give information on specific subjects; to arouse enthusiasm for the day's work; and chiefly to develop a reading habit. It is indisputable that the reading-courses fulfil their objects in the giving of information and in the awakening of interest. How far they develop the reading habit, it is yet too early to say with positiveness. Reasoning from all analogy, there should be no question but that they have this effect.

The reading-courses proceeding from the colleges of agriculture are conceived on the question-and-answer basis. They therefore hold a close teacher-and-student relationship with the reader, dealing with him privately. The work is systematic and organized. In this regard, the reading-course can hold a more effective teaching relationship with the correspondent than can an agricultural paper; and, as the reading-course is supported by public funds, the reader feels that all information comes without business motive. On the other hand, the sympathetic editor of an agricultural paper may hold a friendship relation with the reader such as obtains in almost no other way; and the reader comes to him for advice on a multitude of questions that are quite aside from the technical information about agriculture. It is probable that agricultural journals will find it to their advantage to enlarge this correspondence phase of their work to include more of the systematized reading-course features. The reading-courses and periodicals are not antagonistic or competitive agencies. There is not only room for both, but whatever develops the reading-habit necessarily makes a demand for more reading. It is the part of the agricultural press to supply some of this reading; books, bulletins and reports will supply some of it. Inquiries have indicated that persons taking free reading-courses, also read more freely of other matter than they did before entering such courses.

History of reading-courses.

It is probably not possible to discover what was the very first reading-course suggestion for farmers. One can not read far in the history of the agricultural colleges without finding beginnings of the idea —the desire that farmers be given more and better reading matter. This idea was expressed before any of the agricultural colleges came into being. It was thought, however, that the usual work of the college would spread sufficiently the reading habit. But so many farmers do not go to college and are not touched by it, and so much new knowledge has come into the farmer's horizon, that some special machinery was needed to carry something of the college influence to the farm.

As early as 1882, President James Mills, of the Agricultural College of Ontario, outlined a reading-course for farmers. The council of agriculture and arts for the province coöperated in the enterprise. Certificates were offered to those completing required courses of reading. These certificates were of first, second, and third class; and six liberal prizes or scholarships were offered, one for the first class, two for the second class, three for the third class. A few persons took up the reading and passed creditable examinations on questions that were submitted to them; but the prizes went mostly to ex-students of the college, and the number became so small after a time that the enterprise was dropped, and has not been resumed.

In Pennsylvania, the director of the experiment station, in his report to the president of the college in 1891, suggested a reading-course as a means of popularizing station work. In July, 1892, a reading-course was established in connection with the Pennsylvania State College; and the course early gained much reputation. The Pennsylvania reading-course is modeled on the Chautauqua plan. It was first known as the Chautauqua Course of Home Reading in Agriculture. The college provided books, and gave examinations on them. The plan was afterward modified to give assistance, through correspondence, to students who found the books to be difficult. The name of the enterprise was changed to the Chautauqua Course of Home Study in Agriculture. More than three thousand students were registered in this course. This plan, also, had its difficulties: (1) It was impossible to secure suitable text-books; (2) it was found to be a very difficult matter for most students to pursue the study of books by themselves, and to sift out the essential from the non-essential parts. The next movement was to send out printed lessons on particular subjects treated in the books. These lessons were first issued in November, 1897, covering seven text-books. The lessons were designed to bring the subject-matter of the books up to date, to describe simple experiments, to illustrate the subject, to suggest the important or fundamental matters. The experiment was successful, and in the winter of 1898–99 lessons were issued on sixteen books, and on farm bookkeeping, making seventeen subjects. In 1897, the name of the enterprise became Correspondence Courses in Agriculture, and this title it now bears. At the present time, in many of the Pennsylvania courses the instruction is given wholly by printed lessons, although books are recommended for supplementary reading. The total nnmber of students enrolled since the establishment of the Correspondence Courses in 1897 np to April 8, 1908, has been something over five thousand and fifty. Six hundred and one of these had been enrolled within the year preceding April, 1908. Three thousand two hundred and thirty-one reports were corrected and returned during that year. Up to April, 1908, instruction had been given in thirty-one courses: nine in general agricnlture, seven in animal husbandry, four in horticulture, seven in dairying, and four miscellaneous courses. Since April 8, 1908, two new courses have been added and 500 students enrolled. The enrollment has been approximately twice as great this year (1908) as during the same months of any previous year.

At the Michigan Agricultural College, a reading-course, known as the Michigan Farm Home Reading Circle, on the Pennsylvania plan, was started in December, 1892. In January, 1894, the New Hampshire College of Agriculture and the Mechanic Arts established a non-resident course in agriculture. The course was designed primarily to meet the needs of those farmers' sons who are unable to leave home to attend college, but who feel the need of the fuller knowledge of their work which the college offers. It is not now in operation. The Agricultural College of Connecticut inaugurated correspondence instruction in October, 1896, on the correspondence-school plan, but the work has been discontinued. The College of Agriculture at Cornell University began a reading-course in November, 1896, on a different plan from the preceding, the effort being to provide elementary reading for those who were not in the habit of reading books or bulletins. This New York enterprise now has two parts, with an officer directing each one,—the farmers' reading-course, and the farmers' wives' reading-course. It has assumed rather large proportions. Other reading-courses, some of them little organized, were begun before 1900, in connection with colleges in West Virginia, South Dakota, Indiana, Texas, Rhode Island, Missouri, Tennessee, Virginia (Hampton), Massachusetts, and perhaps elsewhere. [Further historical and other notes may be found in Bulletin No. 72, Office of Experiment Stations, United States Department of Agriculture, 1899, on "Farmers' Reading-Courses," by L. H. Bailey.]

Aside from courses for farmers, reading-conrses and study clubs for rural teachers are now in operation in some states.

Two or three commercial correspondence schools are now giving instruction in agriculture.

Methods in reading-courses.

Two distinct ideas are represented in the reading-courses outlined in the preceding paragraphs. The older or Chautauqua-Pennsylvania idea is that of a definite, prescribed, self-limited, technical correspondence curriculum, the completion of which is signalized by a certificate or diploma. The other, or Cornell idea, is that of a flexible, non-limited, untechnical reading-course in which there is no system of counts, and which does not lead to certificatory honors. The former is intensive; it is adapted to the few. The latter is elementary; it is adapted to the many.

The ideal reading-course system is probably one that would join the two ideas. Its general work would be to touch and awaken every farmer, particularly every poor farmer; it searches out the man who has small opportunities. Its special work wonld be to aid the few who are already successful; it accepts the man of fair or large opportunities. If the primary object of a reading-course is a mission, the Cornell system would seem to be the better; if the object is technical education, the Pennsylvania or curriculum system is the better. But since the complete reading-course is both a missionary and a schoolmaster, it is evident that the two systems might be conjoined.

A given amount of money will reach more persons in the elementary system. If the funds are not at hand for the publication of lessons, existing bulletins may be ntilized, or the reader may be asked to buy the lesson, and the expense of it would be less than the buying of books. The lessons or the bulletins have more local and personal application than books do. There is, or should be, less of detail in them. But every effort should be made to lead the reader into the larger horizon of book reading. As fast as persons are ready for books, lists should be supplied and graded courses suggested. For those who go far enough in the intensive reading and study of books, a certificate may be provided: but this certificate should not count toward an academic degree.

Organization of the readers is a prime requisite in all reading-courses, but particularly in the elementary system. Small circles or clubs are relatively more effective than large ones. Twenty persons is perhaps an outside number for greatest efficiency. If a grange or other society takes the reading-course, and its members are many, it is well to consider the dividing of the membership into two or more clubs or subcircles. Several small clubs in a community stimulate emulation. In a small circle, every member takes a part in the discussions.

The literature must be distributed promptly at the appointed time. This is particularly important if independent lessons are used, for the circle depends on a lesson for new subject-matter at the session. The reading matter should be promised for a definite time and withheld until that time. The circle may devote as many sessions as it desires to each lesson.

It is of the greatest importance that these reading-courses teach the reasons why—the general or underlying truths. The superintendent of a reading-course can not know the local and personal conditions that underlie methods of practice, and the greater part of his energies would be dissipated if he attempted to discuss them. But the members of the circles or clubs should be encouraged to make application for themselves of the principles under discussion. It is far better to elucidate a very few underlying principles and to encourage the application and illustration of them on each farm than to give any amount of mere information and advice.

A promise of a visit from some person officially connected with the reading-course acts as a powerful stimulus. Such visit should be regarded as a premium on efficient work, not as a matter of course or of right. One visit each winter will be sufficient to keep up the interest, particularly if it is made rather late in the winter, when enthusiasm usually begins to lag.

The reading-course is an excellent supplement to the farmers' institute. The ideal legacy of an institute is a reading-course. One or two of the speakers might be delegated to organize such courses, and also to visit and inspect clubs or circles in the neighborhood.

Demonstration experiments on farms may well work out of the reading-courses, giving the correspondents an opportunity to prove the work and also maintaining interest through the growing season.

Books that are useful for rural communities.

There is very little good literature that is specially adapted to rural communities except the technical agricultural books and bulletins. It is often said that farm homes are greatly lacking in books and in magazines. This, no doubt, is often true. One reason is that there is so little literature that is really adapted to the farmer's general demands. The fiction has no special relation to the conditions under which the farmer lives, and very much of it no relation to any present-day problems. It is not advisable that all reading have relation to the life of the present, but some of it certainly should be applicable in order that it may have meaning to the reader. We have practically no novels depicting the real farmer. We have farmer characters in current fiction, but most of them are caricatures, whether so intended or not, and present a type of life and a vocabulary which, if it exists at all, is greatly the exception. Common novels are likely to be exotic. A good part of them are read merely because they are the best sellers of the time.

The bulletins of the experiment stations and departments of agriculture are now widely distributed, but they are not used as much as they ought to be. This is in part because the mailing-lists are not selective, and in part because the reader may have no real fundamental knowledge to enable him to use them effectively. In some cases the bulletins themselves are unreadable and are only reference texts. The agricultural journals are likely to comprise mostly comments on practice and on current events.

We have practically no good poems of American farm life. A poem of the plowboy is very likely to be one that sees the plowboy from the highway rather than one that expresses the real poetry and sentiment of labor on the land. It would be very difficult to find a dozen first-class American poems of farm life. Farm poems are largely written from the study outward, and by persons who see farming at long range, or who come to it with the city man's point of view.

The nature books are largely forced and lack personality. They do not have the true ring of truth. We need good nature books applied to farm operations and farm objects.

Of late, the reportorial type of literature has developed itself in country-life directions. The reporter discovers a high point here and there, does not understand relationships, writes something that is effervescent and entertaining and very likely misleading. The "wonders-of-science" idea has also applied itself to agricultural writing, and we are beginning to develop a type of literature that is unsafe.

There are gilded publications that appeal to city persons who have no intrinsic interest in the country, or to those who have abundant money to spend; but they have very little, if any, influence on the development of a native country life.

We have no histories of farm life or farm people. The effort to compile biographies for this Cyclopedia has forced this remark. The result of this is that there is no ideal of leadership in agricultural or country-life affairs put before the boy or girl. The biographies that the youth reads are of persons who have made their way in other careers. Yet, as a matter of fact, hundreds of country persons whose names are unknown to the standard books have exerted an influence that is truly national in its character.

What rural libraries may do.

There should be a library in every rural town. This library should have relation to its community, as a school or a church has. It should be an educational center.

The traveling library (page 306) has provided a new way of developing the reading habit in the country and in remote towns. It undoubtedly has had great influence, although the character of its literature may need to be reconsidered. The farmer's work is largely in the presence of the elemental forces of nature. These forces are beyond his power to make or to unmake. He cannot change the rain or sunshine or storm or drought. He is likely, therefore, to develop an attitude of helplessness toward his conditions and to feel that there is very little use to exert himself over-much, because he is confronted by inexorable phenomena. This outlook of helplessness is to be conquered by giving the man the power of science, whereby he may in some degree overcome, control or mitigate the forces of nature, or at lease effectively adjust himself to them. To a large extent the effect of library work is to cause persons to read for entertainment. The countryman, however, needs to read for courage. Herein is where library schemes are likely to be fundamentally weak, if in fact not radically wrong for the countryman. We need not eliminate the natural desire of anybody to read for entertainment; but we should make a special effort to develop in the countryman a habit of reading such things as will give him personal mastery over his conditions.

Every social or educational organization that exists in the open country should be a means of developing and spreading the reading habit. The farmers' institutes, as we have indicated, should leave behind them some kind of an organization that will continue the work of the institute and develop the reference habit. All country churches, and all country schools, should also be agents in the same cause. All these organizations should be made distributive centers for good literature. They should all aid in distributing the bulletins of the experiment station of the state. The local library will often be able to distribute the experiment station bulletins much more effectively than the experiment station itself, because the library should know the local needs and the habits of life of its constituents.

We are much in need of a coördination or association of all these various efforts. If there is no formal organization as between them all, there should at least be a coöperative interest between them so that they will all work together harmoniously toward one end. All these agencies should be active. They should know what other agencies are doing. Each one of them should preserve its full autonomy, but it will do more productive work if it knows its own field, and will be stimulated to greater effort if it knows what other organizations are doing.

If libraries and librarians are only a means of distributing books, all that they need to do is to perfect the machinery or the mechanics of the work. If they are to energize the people and to help redirect the currents of civilization, they must do very much more than this. They must inspire the reading habit, direct it, and then satisfy it. We need not so much to know just what kind of books to put in the hands of readers as to develop a new purpose in library effort. All library effort in rural communities has an obligation to be a part of the general educational and welfare work in which all persons are interested who are looking to the evolution of institutions and the betterment of their fellows.

IX. Farmers' Institutes

The farmers' institute movement is only in part connected with colleges of agriculture. In about half of the states and provinces, the institutes are under governmental control, and in the other half mostly under college control. The contemporaneous institute work is so much the product of colleges and experiment stations, however, so far as subject-matter is concerned, that a discussion of it is not out of place in an article dealing with the scope and work of colleges of agriculture.

The machinery of administration of farmers' institutes is of two general kinds—it may be directly under governmental auspices, or directly in the hands of an educational institution. The governmental control may be of four general kinds—in charge of a state department of agriculture, in charge of an independent state officer, in charge of county organizations, in charge of rural societies that receive state or provincial bounties.

History.

Although the institute movement, as now understood, is a product of the past twenty-five years, the beginnings of it are remote and are difficult to ascertain. It came up at first out of the agricultural societies and state boards of agriculture, and, later, an independent movement came from the Land-Grant colleges.

In the earliest agricultural societies the germs of the itinerant or occasional-instruction system may be found. Very definite ideas about traveling lectures were afloat by the middle of the past century. As early as 1842 or 1843, such lectures were inaugurated by the New York State Agricultural Society, and these were so successful that the society adopted a resolution commending them, at a meeting held in Albany, January 20, 1848.

Massachusetts early took steps to inaugurate a series of farmers' institutes through the endeavors of the State Board of Agriculture. In September, 1852, the Massachusetts Board of Agriculture appointed a committee to report on the best means of promoting agriculture in the state by means of lectures. In 1853, Dr. Hitchcock, of Amherst College, read a paper before the Board, on "Farmers'

Institutes." A reference to such meetings is to be found in the records of the secretary of the State Board of Agriculture, under date of January 21, 1859, when it was voted by the Board "to appoint a committee to consider and report upon the propriety of instituting meetings similar to teachers' institutes." This committee reported February 3, 1859, in favor of holding such meetings, and recommended that they be commenced as soon as possible. February 1, 1871, the Board voted "that the various agricultural societies of the Commonwealth be requested to organize an annual meeting for lectures and discussions at such time and place as may be convenient for each society: these meetings to be denominated 'The Farmers' Institute of Massachusetts.'" February 7, 1878, it was voted: "That the agricultural societies receiving the bounty of the Commonwealth be requested to arrange and hold one or more farmers' institutes each year within their limits; and that they be informed that the board will render all the assistance in its power to make such institutes instructive and useful to the public."

The legal authority for the holding of institutes in Michigan, in connection with the Agricultural College, is held to be derived from the following clause in the organic law of 1861: "The State board of agriculture may institute winter courses of lectures for others than students of the institution, under necessary rules and regulations." This Michigan law possesses unusual interest, for it is probably the first legal authority conferred on an educational institution in this country to carry instruction to farmers who are not students in the college. In 1875, the institute movement started in Michigan, from the Agricultural College.

As early as 1869 and 1870, itinerant meetings were held in Iowa by Welch, Roberts, Bessey, Jones, Matthews, and Mrs. Tupper, the expenses being met by the community in which the institute was held. In 1871, an account of "farmers' institutes" was published in the report of the board of trustees of the Iowa Agricultural College, in which it is said that the "experiment of holding farmers' institutes in different localities in the State, for the purpose of giving familiar lectures on prominent topics in agriculture, was tried last winter with very gratifying success. Institutes, lasting three days, were held at Cedar Falls, Council Bluffs, Washington and Muscatine, at each of which points we found an enthusiastic gathering of farmers."

In Maine, Connecticut, Vermont, New Hampshire, Maryland, Pennsylvania, Ohio, and other states, the movement also expressed itself very early, in much the same form as in the instances above mentioned. [For further historical and other notes on Farmers' Institutes, see Bulletins 79 and 174, Office of Experiment Stations, of the United States Department of Agriculture, 1900 and 1906, by L. H. Bailey and John Hamilton, respectively.]

The history in Ohio is very significant, for it was there that the present institute idea, extending the work to all counties of a state, seems to have matured. As early as 1845, Dr. N. S. Townshend had suggested something like institute instruction, and similar suggestions and recommendations were continued by others, Governor Trimble being among them. In May 1880, W. I. Chamberlain was elected Secretary of the State Board of Agriculture, and specifically in order that the general work of the Board might be increased. The Board instructed him to present a paper giving distinct outlines of such enlarged work. On September 7, 1880, he presented definite plans to the Board, in which, among other enlarged work, he recommended the holding of numerous farmers' institutes. His argument at a previous meeting was somewhat as follows: If a very few farmers' meetings are worth while in any state, which are attended only by the leaders of agriculture over the whole state, then numerous ones, say one or more in each county, would be far better in the way of agricultural education; and he definitely recommended that the Board appropriate sufficient funds from the surplus earnings of the state fair, to carry such work until the legislature could make appropriations. The Board unanimously voted that he be instructed to conduct such work for the fiscal year, at an expense not to exceed one thousand dollars, and that the matter be brought before the legislature for increased appropriation. Following these instructions, Secretary Chamberlain organized and attended about thirty farmers' institutes in several counties of the state, that winter, and presented the matter to the legislature, which appropriated about six thousand dollars, including the state printing, for carrying the work the next fiscal year. This amount has gradually been increased until the present time.

Practically all the states and territories are now provided with farmers' institutes of some kind. The attendance at the institutes in the United States now reaches about two million persons yearly, the teaching staff employed by the states is about one thousand persons, and the local lecturers and speakers are about three times that number. About a quarter of a million of dollars is appropriated by the states for farmers' institute work. The United States Department of Agriculture has a Farmers' Institute Specialist (John Hamilton), who is an officer of the Office of Experiment Stations. The American Association of Farmers' Institute Workers was organized at Watertown, Wisconsin, March 13, 1896. It meets annually to discuss all questions involved in the betterment of farmers' institute work.

The following statement of the history in Canada is prepared by C. C. James, Deputy Minister of Agriculture for Ontario:

In 1885, Dr. Mills, then president of the Ontario Agricultural College, thought that both for the sake of the professors at the college and for the benefit of the agricultural community, farmers' institute meetings should be given a trial in the province. First, a few members of the staff were sent out two by two. In the year, two practical farmers of wide experience were added, making each delegation to consist of two professors and one farmer. The work grew, and the next step was to increase the number of delegates, sending one professor and one farmer together. For a number of years the movement was directed by the president of the Agricultural College. Finally, it grew to such proportion that it was found advisable to appoint a special superintendent, whose office, after a few months, was moved from the Agricultural College to the Department of Agriculture at Toronto, and here it has been ever since.

The next province to take up farmers' institute work was Manitoba, where it was controlled directly by the Provincial Department of Agriculture.

The Dominion Department of Agriculture then took up the work from Ottawa and organized a series of meetings in the territories and in the provinces. This work, however, has been gradually taken over by the various provinces, so that now it is controlled entirely as a provincial concern. The most thorough organization still exists in Ontario and Manitoba where it is the plan to adopt the electoral district as the area to be covered by each institute.

The institute work in Canada is maintained partly by local assistance and partly by speakers sent out under the direction of the provincial superintendent. In Ontario, the Department of Agriculture makes a grant of twenty-five dollars to each institute and supplies speakers for at least one series of meetings. An outcome of this work, in recent years, is the organization of women's institutes, which are controlled and directed largely in the same manner as farmers' institutes.

The institute work.

Farmers' institutes have been the means of arousing dormant communities, and also of inspiring and giving confidence to those that were already alert. They have exerted unmeasurable influence on the practice of agriculture and the ideals of country life. The character of the institute instruction has changed greatly in its subject-matter in the last ten years. This is due to the increasing discovery of fact, and also to the general rise in demand on the part of the farmers themselves. The agricultural public would not now accept much of the best teaching that it was possible to give ten years ago. Similar change will undoubtedly be demanded in years to come; therefore, if the institute enterprise is inelastic, it will fail of its ultimate goal.

The institute workers are themselves fully awake to the situation, and are making strong efforts to meet the increasing demands. The use and application of new subject-matter will be made as a matter of course. It is probable, however, that considerable change may be necessary in the organization and plan of much of the institute work. Agricultural colleges should now begin directly to train men and women for this kind of effort (page 437) as consciously as they have heretofore trained persons for experiment station and regular teaching work. These men and women must be trained not only in the subject-matter of technical agriculture, but also in the underlying social, ethical, sanitary and economic questions of country life. This will be increasingly necessary, since it will be more true in the future than it has been in the past that the expert of today is the practical man of tomorrow.

The function of the institutes is to educate the people on their own ground. It is a phase of extension work that carries education directly to the localities in which the people live. It deals less with individual men on their farms than with small communities or groups of men; it therefore has the opportunity to exert great influence in developing the social life of rural neighborhoods. Institute education should be dynamic. It should stimulate initiative and develop incentive in the locality, and set forth the best community ideals.

The field of institute activity, therefore, is of two general kinds,—instruction in technical agriculture, and the developing of a community sense.

The direct exposition work of the institute is accomplished by several means: (1) By lectures. This is the easiest and least effective form of institute teaching. (2) By means of object-teaching, which rests on the assembling of materials in the institute hall and the making of demonstrations. A still better form of object-teaching may be developed by holding the institute on an actual farm and making the farm property and operations the specific basis of the instruction. (3) The assigning of special expert teachers to particular localities. A first-class institute teacher will be wanted in the same locality year after year. He learns the conditions in that locality and knows the people. He becomes the natural leader in a geographical or agricultural region. The giving of instruction wholly by strangers is not productive of the best results in the development of good local practice. (4) In certain localities and under certain conditions, the institutes should be of longer duration than one or two days. They should be in the nature of movable schools, or local conventions, giving instruction that is founded on at least a cursory investigation of the needs of the particular community. If a movable school of this kind could follow an agricultural survey, such as is mentioned on page 453, the results should be unusually good. Such schools should be located with reference to the needs of the community, and the knowledge that the speakers may have of the local conditions. Experience has shown that such schools may well devote each session to one topic, provided that the best expert is put in charge of it. The attendants may be regularly enrolled, and something in the nature of a quiz or examination may sometimes be held. Schools of this kind were held in New York from 1894 to 1896, with excellent results (see Cornell Bulletins Nos. 110 and 122), and they are held, also, in other states. As the work of the institutes grows and as the public demand becomes more discriminating, this kind of sustained effort will be more and more in demand. (5) The holding of an annual summing-up meeting, in the nature of a "round-up," to focus the attention of the entire state and to solidify the work. These final meetings are now a regular part of most institute work, and their effect on public sentiment, as well as their helpfulness to participants, has been marked.

Institute teaching is naturally under obligation to arouse the community sense in every neighborhood that it enters. This it may accomplish by various means, some of which are as follows: (1) It may encourage initiative in the localities by placing the responsibility for the management of the institute as much as possible on the people of the community. It is necessary to develop a state administration of institutes, but a good part of the responsibility of the success of the meetings should lie with local clubs, or temporary organizations brought together for the purpose. It should rest with such local organizations to see that proper quarters are secured, that local expenses are met, that conflicts with other meetings are avoided, that entertainment for visitors is provided, that the attendance is good, that the requests for subject-matter are such as will be particularly applicable to the region, and that the program is not burdened with irrelevant local matters. (2) Every institute should establish or confirm an organization in the locality to continue the work. It may stimulate an existing grange, farmers' club, horticultural society, village improvement society, reading-club, local board of trade, or it may be the means of developing a wholly new group. (3) It should leave suggestions of definite work to be done by the local organization, as something in the nature of a program for neighborhood meetings, or practical suggestions as to demonstration experiments, remodeling of the schoolhouse, reorganizing the course of study in the school, consolidating the churches, developing good roads, or other welfare work. (4) Every institute of two or more days duration should provide one good evening lecture on social work by a person who has followed the rural phases of the subject.

As an institution, farmers' institutes may be conducted by the state government represented in the board or department of agriculture, by an association of societies, or by the Land-Grant college. What mode should be adopted in any state is largely a matter of detail; yet it must be remembered that the college of agriculture must of necessity conduct extension work with about the same volume that it conducts regular teaching and research work, and very much of this extension enterprise will necessarily be of an institute character. The extension department of a college of agriculture must give lectures about the state, make demonstrations and experiments on farms, inspect agricultural enterprises, conduct reading-courses, and do many other things that, even if not institute work themselves, should nevertheless closely coördinate with institute work. Reading-courses and farmers' institutes, for example, should issue from one headquarters, in the interest of effectiveness more than in the interest of economy of money and effort. Moreover, the college and experiment station are producing and proving the subject-matter that should be constantly flowing out to the people of the state. The institute force should be a part of a college force in order to be fully up to date with information and to teach safely. This does not mean that the institute worker must necessarily be of the college professor type, for we are to train men specially for institutes and other forms of extension effort (page 437). The institute worker of the future will be a real farmer who is associated in some way with a college or experiment station; and the remaining staff of the college and station will attend institutes only on occasion, when the services of an expert in some special field are needed. No person is a good teacher who is not also a student. Coöperation between the college and the institutes is good, but it is only temporizing: the institute should be a real part of the extension department of the college, when the time shall come that such departments are properly organized.

X. The Destiny of Agricultural College Students

Ever since the colleges of agriculture came into existence, they have been criticized because so many of the graduates have failed to become farmers. Even at the present day, when more discriminating judgments are to be expected, the statement is often made as a charge against these colleges. This raises the whole question as to what is to be expected of these colleges, so far as the destination of their students is concerned.

It is unfair to count only the graduates of a college. The graduates of any college are few in proportion to the number who enter. Those who drop out are none the less members of the college, and their fortunes should be followed. Among such members of colleges of agriculture will be found some of the best farmers. The special students must not be overlooked. They are among the best products of the colleges. The great number of short course students should also be considered; these usually return to agricultural affairs.

It is true that many of the graduates of the colleges of agriculture have not taken up practical farming. They have been needed elsewhere, and they have been of much more service to agriculture than they would have been as farmers. They have been needed to develop the science and the literature of the subject, to provide leadership, and to establish educational standards. Yet, a good part of these graduates have gone to farming. It is probable that the proportion of students of the leading colleges of agriculture who now engage in pursuits related to agriculture, is greater than the proportion of students of law colleges, or other professional colleges, who follow the profession represented by their institution.

Popular disregard of educational values.

It is a question whether the public holds a rational expectation toward the colleges of agriculture. Other colleges have been more free to insist that the people shall accept their terms and standards: the agricultural colleges have made every concession to the people. In this effort, the agricultural colleges have expressed their desire to be of use and have well proved their right to public confidence. The best of them are now no longer obliged to ask for students. Other grades of schools will be established or developed to do much of the preparatory work (page 467).

It is well to ask whether there is a proper appreciation on the part of the rural public of the values in education. Usually the short courses are chosen because they require little time and cost little money; but these reasons are really expressions of a low estimate of educational values. One who takes a short course misses the value of the time-element in education. The student is growing and changing. It requires time to develop his perspective and his sense of relationships, as well as for the studies themselves to become central with him as if a very part of his mental fiber. Judgment develops slowly.

A word may be said on the question of the cost of good training. It is true that very many of our good farm families really cannot afford to send the son or the daughter through college, and, therefore, the government is wise in providing short and cheap courses. But, on the other hand, much of the economy practiced in respect to the college boy is the expression of a lack of full appreciation of the value of higher education. Farm boys will work themselves through college with heroism, often to the detriment of health and to the sacrifice of studies, or take only short courses, when the parents can well afford the means to give them comfortable advantages. The well-to-do man of this day counts the cost of higher education for his children as one of the stated and recognized outlays of bringing up a family, much as he counts the cost of food and shelter and comfort.

The time is at hand when a college career must be expected as much for the boy or girl who is to live on the farm as for any other boy or girl. This is the one way whereby country life may be permanently elevated. There is no more reason why the farmer boy, more than any other boy, should be given a cheap and fragmentary course. One of the greatest handicaps in college work is the widespread feeling that incomplete and condensed courses of instruction are sufficient for a farm boy.

The obligation on the part of the farm.

It is natural and right that a college graduate should enter the line of work that pays him best and is most attractive to him; and it is the proof of the value of an education by means of agriculture, that it fits a man as well as other education does. If the college man were content to accept the low remuneration of the hired man, or the share-worker, or the ordinary foreman, it would mean that his course of study had developed neither power nor ideals.

Agriculture must rise to meet the college man. A farmer has no right to expect that the college can do everything for his son. The son should have been developed farmward long before he goes to college, if he is to become a farmer. There may also be good reasons in the farm itself why the boy does not go back. A farmer complains that his son has not returned from college to the farm; but the farm may not be worthy of him. There may be nothing on that particular farm that can hold the attention of a young man whose sensitiveness has been quickened and whose ideals have been elevated. The father, remaining on the farm, had not realized all this. He had never thought that the son's point of view on most questions would be greatly changed.

Often the college man is no longer content on the farm because of lack of congenial associates. There is no one in sympathy with his new attitude of mind. He is aware that he is a subject of silent curiosity and sometimes even ridicule. Often there is no opportunity allowed him on the farm to work out the new methods and to express his new ambitions. We have assumed that the whole burden of responsibility rests on the agricultural college, but it really rests in good part on the farm.

Should all agricultural college students be farmers?

We may consider whether it is really desirable that all the students from an agricultural college shall engage in agricultural pursuits. The first great contest of the agricultural college was to convince the public, particularly the agricultural public, that higher education is needed for agriculture. That contest is now merely a memory. The second epoch is now on — whether agricultural and country life subjects can be made the means of educating a man broadly, independent of the particular vocation that he is to follow. In other words, shall agricultural education be severely technical and professional, or shall it be broadly educational? It is evident that these subjects are considered to have excellent training and disciplinary value from the fact that fully thirty states, territories, and provinces in North America have now taken some kind of official action looking toward the introduction of agricultural subjects into the common schools. The common public schools do not teach the professions and trades. The result of good industrial education is to put the pupil into contact with his own problem, to place him near the load, to develop his creative and constructive instincts, to give his schooling purpose and meaning, to awaken a living sympathy with the moving questions of the time, to fit him to live. The whole trend of education is to put the scholar into the actual work of the world; therefore, nothing can prevent the introduction of agricultural topics into the schools, except a fundamental change in our point of view on the needs and progress of civilization.

The colleges and universities are leading in industrial training; but presently the methods of the primary and secondary schools will reshape themselves (without sacrificing the literary and so-called cultural phases of education), so that there will be harmony throughout the entire system. Then we shall find that the industrial courses will be pursued for their true educational and cultural value, as well as for their technical value. There is now a marked tendency for young men of means, who are not pressed by the necessity of a trade or profession, to pursue the courses in colleges of mechanic arts because they feel that such courses provide a liberal and inspiring education. Whatever one's convictions as to the desirableness or undesirableness of this tendency, its significance is nevertheless apparent; it means that these subjects are now fully established in popular regard, and are considered to be worthy partners of traditional academic courses. When departmental or semi-professional education reaches this stage, it is able to make public sentiment rapidly, and to aid in creating a new leadership and meaning for the subjects for which it stands. Some persons still contend that only the pursuit of the group of subjects known as "the humanities" leads to the highest educational results; but all education will lead to what we ought to know as culture.

The older college men remember the early efforts to try to account for every student that has passed through an agricultural college as engaged in agriculture. We shall soon be equally proud of every graduate of such a college who turns out to be a useful citizen in any walk in life, in country or city. The agricultural colleges are rapidly developing a system of education for country life, meaning, by that phrase, the utilizing of agricultural and outdoor subjects to develop the student into a man of sensitiveness and power. The home, the school, the church, the road, the rural community, the relation of all this to citizenship and politics, the love of nature, the development of the art-sense and the love of literature—all these, as well as the specific agricultural subjects, are comprised in the curriculum of the modern college of agriculture.

Agricultural education has passed through a period of development, as all other education has; it has appealed to the few rather than to the many. The man of special parts has gone to college. For such men there are always special opportunities. In the last fifty years the commercial world has been upset and reorganized, calling everywhere for men of ability. The farm has furnished a remarkable share of these men, for the farm boy is industrious, frugal, and able to turn his attention to many enterprises. We think it strange that the college student has not gone back to the farm; it would be stranger if the men of unusual ability had gone back to the farm. To capable men the door of opportunity always opens: they enter.

Another type of youth who has gone to college is the one who cares for books more than for affairs. The college satisfies him. He is willing to remain in an inferior position if only he can have access to libraries and to the company of bookish men. This is not anomalous or even strange. Some men like cattle, some like steam-engines, some like books. Of course, the bookman is not adapted to be a farmer. If he goes back to the farm, he becomes the "book-farmer." He has missed his calling, and he has had his day. There are places in the world for this man, and these places he is now finding.

The colleges of agriculture are now attracting more of the men who intend to be farmers.

It will be interesting to have the views of Justin S. Morrill, author of the Land-Grant Act, on this question (1888): "None of these colleges, however, will make special pursuits of life compulsory. There is no assumed heredity in the vocation of the farmer, and his son has all the world before him where to choose his calling as much as the son of the minister or the lawyer. It does not follow that whoever goes to an agricultural college must be a farmer, any more than that 'whoever drives fat oxen must himself be fat.' All who wish to be equipped for agriculture, or for some mechanic art, will naturally devote more time to the related fundamental sciences. Those proposing to follow a professional life will be more industrious and thorough in the direction of ancient, as well as of modern classical lore. But it will do the latter no harm to observe something of the wide extent of that instruction which must guide and lead the industrial forces of a great nation, and it will do the former good to witness the persistent appreciation accorded to literary culture. In the aggregate all may obtain a liberal and generous education, and will be nobler men from having been associated together. If there is any friction, it will have served to polish both."

Attitude toward the young college man as a farmer.

The public seems to expect more of graduates of colleges of agriculture than of those of other kinds of colleges. They expect that these men will be able to do all kinds of farm work, tell just what the soil "needs," know what to do with animals in health and disease, and in particular to be able to restore a run-down farm to profitableness and to be willing to do it "on shares." Persons do not seem to realize the fact that agriculture is a name not for one occupation but for a series of many occupations, and every one of them should require special training. The average college graduate is not yet a mature man; he has not had much practical experience with more than one kind of farming, and of course this experience cannot be gained at college; his judgment must be developed and proved.

The graduate of a college of law reads law for a time before he enters practice; the graduate in architecture enters an architect's office; a graduate in medicine engages in hospital service; a graduate in mechanics enters a shop to learn the business; yet it is expected that a graduate in agriculture will be able at once to assume full responsibility for a big business, and he is censured if he makes a mistake. The trouble is that there are no adequate opportunities as yet, in this country, for the graduate in agriculture to learn the business or to test himself, as there are for other students. Farmers do not take students on such a basis. Most farms do not properly instruct the boys before sending them to college. The net result is, that while much is expected of the student in agriculture, little opportunity is afforded him in the way of any training that fitly supplements his college course. The agricultural colleges cannot do their best work for the farms until the farms come to their aid.

In contrast with these remarks, it should be said that certain other persons expect too little of these college men; or, in other words, they do not give them sufficient freedom and opportunity. In many cases they are given the title of manager but not the power of manager. They may have no more opportunity for initiative than a good hired man. The matter is all the worse when, as very often happens, the employer is not himself a thorough farmer. It is not to be expected that an energetic young college man, who wants to practice what he has learned, will be content or will work to best advantage if he is obliged to proceed under minute daily orders. He expects to assume responsibility, and he should be allowed this privilege as rapidly as he shows himself to be capable of it. Persons who employ a manager must be prepared to give up the hired-man idea.

There is still another phase of the subject to be mentioned: it requires time to bring a run-down farm into profitable productiveness, and it is very frequently the run-down farm that the employer desires to put in the hands of a manager. No man is able to overcome seasons, or to change the fundamental processes of nature. The problems must be worked out gradually. Farming is not the making of good crops in a single year: it is securing the average performance of a piece of land through a series of years. A run-down soil cannot be renovated and revived in the way that we repair a house. The time element is not enough considered by many persons who employ managers, and, as a result, the manager may be discharged before a rational course of action can come to natural maturity.

The training of farm managers.

A course of college instruction in agriculture, however complete, cannot be expected to do more for a man than a comparable course in law or medicine or mechanics can do for its students; perhaps it can do even less, so far as practical results are concerned, because every farm business is a very local problem. Yet a man should be much better prepared for practical farm-manager work by a college training than the same man would be without it. The competitions and complexities of agricultural work are now so many that the very best training is required to enable a man to meet them with any degree of success. The untrained men are hopelessly handicapped, and the disability will become more apparent as time goes on. The college man needs training in business after he leaves college; and he must learn the particular problems of the one enterprise that he is called on to handle. It is time that he receive help, coöperation and encouragement at the period when he is trying to get hold.

It is relatively easy to train a good teacher and perhaps even a good investigator; but it is very difficult to train a good farm manager. This is because so much business sense and executive ability are required in a first-class farm manager. Some persons can never make good managers; but even the most adaptable persons should have had good farm experience before taking on the independent management of an estate, either of their own or of another's. If the father has given the son this experience before sending him to college, the very best start will have been made; if not, then the young man must secure it after he leaves college. A mature student who has formerly partaken in the management of a good farm through some years should make an excellent manager of a farm property on his own account.

The colleges have not yet solved the question of training men for farm managers. There is really no solution to it unless actual farms coöperate with colleges. We shall probably eventually develop a regular system of sending certain students to selected farms in the state, in order to give them a course of training, following the suggestion made on page 465.

One effort has recently been made in the United States (at the University of Chicago) to provide practice training in farm management. This is the formation of an "Agricultural Guild," whereby it is hoped to give college men actual experience on real farms.

The public still seems to think that the college of agriculture can give a man sufficient training in farm practice to fit him for the management of any agricultural estate. Of course, this is impossible. A consideration of the purposes for which a college farm (page 442) is maintained will show at once why it is impossible; and, moreover, a student cannot afford the time and effort when in college to learn the details of a business. It is even a question whether knowledge of farm practice should be required of all students graduating from a college of agriculture. If the object of the college is only to train men for farming, such practical experience may be demanded; but if the object is to educate by means of agricultural subjects, then the institution may or may not require farm experience as a prerequisite of graduation, although it should always require such experience as a requisite to recommendation to farm managerships.

The outlook.

The college man will go to farming as soon as it becomes as profitable for him to do that as to do anything else for which he is fitted. He will find the occupation a means of satisfying his ideals. In the future, only educated men can succeed on the farm as owners and managers. There will soon be enough of these men and women to create public sentiment, to set new standards in country living, and to afford congenial association. The colleges of agriculture must continue to educate by means of agriculture as best they can: where the students shall go and what they shall do will settle itself in the course of time.

Whether these college men go back to the farm also depends in no small degree on the attitude of town folk toward farming; for young men do not like to engage in pursuits that are disparaged or ridiculed.

EDUCATION BY MEANS OF AGRICULTURE IN ELEMENTARY AND SECONDARY REALMS.

It is the particular function of the Land-Grant colleges to provide instruction of the higher grade in agriculture and the mechanic arts. The agricultural part of these colleges is also engaged in much educational effort that is properly not collegiate in the old sense, as we have seen. It is essential that the state college of agriculture in each commonwealth be well enough equipped to enable it to carry all its proper lines of work with ability and enthusiasm. This college, however, can not be expected to carry all the agricultural education of the commonwealth. The public schools must come to its aid. It is even a question whether it will be able to carry all the college education in agriculture in the leading agricultural states. The state college will necessarily hold the headship; but other colleges and universities will develop departments of agriculture, not alone to meet the demands of their patrons but also to enable them to complete an adequate and active curriculum. All real universities, at all events, will need on their own account to provide agricultural instruction of one kind or another. Certain kinds of agricultural work can no doubt be unusually well served by privately endowed institutions.

Where the preliminary education may be provided.

Instruction of an elementary and secondary kind in country life subjects is to be one of the next great developments in education. Several agencies may contribute to this end. What some of these other and secondary educational enterprises may be we shall now consider:

(1) The first effort should be to utilize to the fullest, in primary and secondary instruction in these subjects, the general educational system of the state. All the schools should be open to nature-study, agricultural and other industrial work, on the same conditions and terms as they are open to literary and traditional subjects. It does not follow that the industrial work should be mandatory.

The reasons for utilizing the existing school system are obvious. These systems are already organized and are completely established in public opinion. Again, industrial work in the common schools should be looked on as a broad educational function, and not as mere training or technical or apprenticeship work. It should be recognized as a fundamental educational function by being placed in the public schools along with other subjects. Industrial education should gain immensely in its general purpose and effect and in its intention if it is thus a part of general school work. It does not follow, because a pupil is studying a subject pertaining to the farm, that he is to be a farmer. The subject is introduced in order to educate him broadly, to widen his sympathies, develop his character, and interest him in the affairs of life.

It is probable that the public school system cannot meet all the demands for agriculture education; but even if it cannot do so, its influence will have a tremendous effect in arousing an interest in country life subjects and in elevating the general tone of industrial education. If the common school systems cannot handle the agricultural work efficiently, then we shall need to develop other agencies, and some of these agencies may now be mentioned. These other agencies ought to be connected in some way with the general public educational system and not be separate, parallel and competing systems in themselves. Educational administration should be related and harmonized.

(2) It is not unlikely that the trade-school idea will in time be adapted to agricultural needs, particularly in the training of farm artisans. The technical high school may also be adapted to rural communities.

(3) We may consider the feasibility of introducing agricultural work in the normal schools, as a means of training teachers. We are at once met with a difficulty in the fact that a "normal school" is not the same kind of institution in different states. These schools have differentiated in the past generation until they may not be strictly comparable in two or more regions. What may be found to be practicable in one region, therefore, may be impracticable in another. In parts of the West the normal schools find it possible and advantageous to associate agricultural work with the traditional curriculum. In the East this is less possible, largely because of the great population of the cities which demands more teachers than the normal schools can supply. These normal schools, having their capabilities taxed to the utmost in their accustomed work, may or may not find it to their advantage to add new departments of a wholly original character. As a practical matter, it is very doubtful whether most of the well-settled normal schools in the older states should be called on to teach agriculture. Not only are they overtaxed with other work, but they may not have land; and their pedagogical method is not likely to be adaptable to such work.

(4) A wholly new kind of school may be organized for the explicit purpose of teaching by means of agriculture, household life, and related subjects. Such enterprises are represented by the schools in each of the congressional districts of Alabama and Georgia, by the county schools that are organized and yet to be organized in the state of Wisconsin, and by comparable institutions in other states. These schools have many advantages. They can devote all their energies concretely to one line of effort. They are single and therefore conspicuous, and are not bound by tradition. They have a definite territory, to the boundaries of which they can fill with good extension work. These schools usually have land and, being set aside for a specific object, they develop a first-class equipment that should enable them to carry the work with great efficiency. The disadvantage is that they are segregated from other educational enterprises and therefore are likely to become somewhat narrow. They cannot be expected to serve all the persons of the county or district needing country life education, for relatively few

of the children in the district can attend this school without sleeping away from home; and children fifteen years and under would better sleep at home. They are likely to become largely local schools for the town or small region in which they are situated. These special schools cannot possibly meet all the needs of secondary education in agriculture: all children should have the opportunity of being trained by such means.

Only the public schools can meet the needs of training for children in the primary and intermediate grades. Whether a special kind of school will be developed in time for industrial training for these younger children is a question. It would seem that opportunity should be left to the existing public school system until that system proves its inability to meet the demand; as fast as that inability develops, new agencies of one kind or another must be evolved to cover the need.

We must remember that the public schools are called on to train the great body of industrial workers, as well as the managers, organizers and leaders. Pupils in the schools should be taught how to work. At present we are teaching them chiefly how to study.

Education should not cease with the formal school period. The educational process is only begun and set in motion in this period. All his life, a person should find means of continuing his education and of increasing his efficiency. The public educational system should provide him with this means in the form of continuation-schools of some kind.

We shall now consider more in detail the two great classes of schools in reference to country life work,—the general public school system, and the separate special schools.

I. What May Be Expected of the Public Schools

If the separate special schools cannot provide all the countryward training that is necessary, then it is very important that the most careful attention be given to the public schools. These schools must really solve the fundamental problem, which is, how to make the school work fit the man and woman for real life and at the same time stimulate and develop their ideals. It is not alone that agriculture must have the common schools, but the common schools must have agriculture. The schools will never be vital until they recognize the usual activities of men and women; and one of these activities is agriculture.

The public schools are likely to give the "set" to the pupil's life, often even in elementary grades. The elementary grades may not teach agriculture as such; perhaps even the high school grades may not do this; but all grades should relate the child to his time and place rather than to take him out of his time and place. So far as this effort relates to the nature environment of the child, it is nature-study.

It has been said of late that elementary agriculture will take the place of nature-study. This is not so. So far as elementary agriculture is natively taught, it is nature-study. It matters less what the material of nature-study is in any school, than what its mode and intentions are. It is to be expected that the subject-matter of nature-study teaching will be drawn more and more from gardens, farms, domestic plants and animals, home life, and community interests; but it will be nature-study none the less. It may be nature-study by means of agricultural subjects, or, to use a recent phrase, it is nature-study agriculture.

The tendency of the past generation has been to introduce everything into the school. Just because a subject is useful, or even vital to grown-ups, does not indicate that it should be introduced in the school. All subjects will in time be taught; but they will not all be taught in the same school or to one pupil. There are many good things that ought not to be introduced into one public school.

We need now to simplify the schools. This cannot come merely by dropping out subjects. It must be the result of a complete redirection of methods and even of purpose. The schools must be relieved of faddishness, indirectness, and over-organization. They should be more simple and native, particularly in rural districts.

Our present school reforms mostly proceed on the principle that city schools must be taken as the models. This motive lies behind the demand for consolidated schools: consolidation provides another means whereby country schools may be urbanized. We shall find in time that this philosophy, if not wrong, is at least likely to lead us too far. Even if we grant that present city schools are best for the cities, it does not at all follow that they are best for the country.

Nature-study or experience-teaching.

The nature-study intention must be the means of redirecting the schools. If the nature-study point of view and its mode of operation are fundamental, it will be proper to discuss them further.

Sympathy with any kind of effort or occupation, and good preparation for engaging in it, are matters of slow and long-continued growth. This growth should begin in childhood, and should be aided by the home and the school. The country school carries a greater responsibility than the city school, in proportion to its advantages, for it is charged not only with its own country problems, but with the training of many persons who swell the population of cities. The country school is within the sphere of a very definite series of life occupations.

There is probably no longer any dispute on the proposition that school education should have relation to living or occupation; or, to put it in another way, that school education is only one part or segment of the education of the individual, and that its main effort should harmonize with the normal development of the individual and help to prepare him consciously for the place that he is to occupy in the world. This does not lose sight of the so-called cultural value of education: rather, it makes any and all education a means of culture. We have thought of culture as if it were an abstraction, but the best preparation for the development of a cultivated mind is training in actualities. The basis of education is reality, not make-believe.

The efficiency of the rural school rests on these two propositions: (1) education should develop out of experience; (2) the school should be the natural expression of its community.

The country schools do not exhibit either of these principles (perhaps other schools do not). The subjects taught in them are not the essentials; the school does not represent or express the community. Perhaps there are no schools that really teach the essentials, except as incidents or additions here and there; and essentials cannot be taught incidentally or accidentally. Arithmetic and like studies are not essentials, but are only means of getting at or expressing the essentials.

When the natural experience of the child, particularly of the country child, is put into teaching form, it becomes what we should know as nature-study. In discussing nature-study, we should not think specially of botany or even of plants, of zoölogy or even of animals, or of any concrete subject-matter. We must picture a complete redirection of the school, to put it in line with the real meaning and possibilities of the community, a fundamental change in point of view, a new philosophy of teaching for the country school. If the reader cannot make the term nature-study, which many persons conceive to stand for juvenile biology, seem to him broad enough to express this conception, let him substitute the term experience-teaching.

The present methods and subjects in the rural schools have come to the schools from the outside. If we begin the school work with the child's own world, not with a foreign world or with the child's world as conceived of or remembered by the teacher or the text-book maker, it is plain that we have by that very effort started a revolution.

The status of the nature-study movement.

Experience-teaching has now come to be one of the conspicuous expressions of current educational work, and it is an interest that also attaches strongly to the rising feeling for release from conventionalism. It is expressed in kindergartens, manual-training, and the like, and in that teaching of natural history to which the term nature-study is commonly restricted. Most discussions of nature-study consider only its technical phases as a school exercise, dealing largely with the subject-matter, and the methods of teaching. In such discussions it is difficult for the layman to catch the spirit of it. In reality, the nature-study interest is one of the expressions of an underlying and redirecting tendency in our development. It is unfortunate not to know its philosophy, for we miss its significance.

The nature-study or experience-teaching movement has now sufficient maturity to warrant the making of an inquiry as to its status. Much of the writing and speaking on the subject have been exhortational and propagandic. The movement is gradually being accepted as a necessary and abiding direction in education; here and there a teacher has worked the philosophy into practice, and schools have found a place for some expression of it in the scheme of studies. The growing sentiment and experience are now being reflected in syllabi and courses of study. More than forty states, territories, and provinces have officially recognized nature-study or its closely associated subjects. Sometimes this recognition is the publication of a state course of study, sometimes the adoption of a text-book or recommendation of literature, sometimes the dissemination of leaflets, or, again, the passing of a mandatory law by the legislature. State policies are necessarily conservative, so that this wide recognition means that nature-study is at last fully established in the public confidence.

Perhaps the best treatise on nature-study that could now be made for teachers would be a skilful editorial combination and discussion of the various printed courses of study. The present purpose, however, is to try to determine what are the current conditions and tendencies as expressed by these syllabi. The discussion divides itself into two parts: (*a*) Objects of nature-study; (6) methods of nature-study.

(*a*) *Objects of nature-study.*

A study of the various expressions in the state and other syllabi, as to subjects of nature-study, suggest a number of fairly definite summaries. Some of these conclusions may be stated as follows:

(1) It is the purpose of nature-study to develop the child's native interest in himself and his surroundings. It proceeds on the theory that the best educational procedure with the young is first to direct the personal sentiments, powers and adaptabilities. It is essentially Herbartian. Of course we must consider not only what the child's interests and powers are, but also how he can be aided to grow into a man; but the native adaptabilities cannot be annihilated without endangering the child. It may be even dangerous to try to supress them. If these tendencies and sentiments are not directed, they are likely to develop into wild and wasteful energies. The causes of truancy lie, in part, in our over-diligent efforts to repress the native enthusiasms of the child. A good part of our training of children is expressed merely by the command, "Don't." Each truant is a problem in himself, but it is probable that most truants belong to one or another of three classes: (1) The vicious class; (2) the low-mentality class; (3) the class that will not conform to usages and to customs, and in which the energies tend to run riot, or at least to express themselves in erratic and unconventional ways. These last are the true truants. They are repressed children.

(2) Nature-study, therefore, begins with general, common, normal, and undissected objects and phenomena, rather than with definition and classification, in order that the child may be developed natively. Definition and classification are the result of the accumulation of experience. They are not primary educational means or methods. Definition always lags behind knowledge. It is likely to take the place of experience in the child's mind. It

did in the old botany and grammer and physiology. As soon as we begin to compress knowledge and experience into the limits of definition, we take away the life, spontaneity, and enthusiasm of it. Definitions are for mental guidance after experience has accumulated, and they become more exact with the maturity of the person. No doubt we have over-defined the subject-matter in our textbooks. One who has to explore a new field and to make real progress may not start with a definition at all.

(3) Nature-study is coming more and more to be an out-of-door subject, for the child's interest should center more in the natural and indigenous than in the formal and traditional. It is not our sphere to live chiefly in buildings. Nature-study began very largely with object-lesson work. The objects might have been collected out-of-doors, but they were taken into the school-room to be studied. This was a distinct advance over the older type of object-study, because it tended to substitute natural objects for artificial and geometrical and unpersonal ones; but it did not develop into true nature-study until a distinct effort was made to study the objects and the phenomena just where they occur in their normal relationships. There can be no effective sustained nature-study when the work is confined in a building.

(4) If the object is to develop the child rather than the subject-matter, then we must no longer define nature-study as botany, zoölogy, and geology. The term nature-study is now used almost wholly for work in the elementary and intermediate grades, and not for college and university work. When the nature-study movement first began to make headway, the term was applied to college natural history, and teachers in the colleges protested that they had always been teaching nature-study. We have now differentiated the nature-study philosophy from the teaching of science, although nature-study is by no means unscientific. Nature-study has been put into the first grades, which means that it has been accepted as fundamental education, and not as special or technical education. The fears of the scientists that nature-study would cheapen and superficialize the work in science are now seldom expressed, because it is well accepted that the two kinds of work belong to different stages in the development of the pupil. Many of the criticisms that have been made against nature-study are wholly inapplicable, because they have come from the specialist's or from the college man's point of view, rather than from the child's or the primary teacher's point of view. Nature-study must be propagated for itself, not with reference to its effect on science. The measures of good work as known to the teacher in the college, or even in the high school, may not apply to work in the beginning grades. In fact, it is too often the case that the teacher in the higher branches may not be qualified to express an opinion on elementary nature-study work. No doubt some of the mistakes in nature-study teaching are traceable to college men on whom much of the initial propagandic work has necessarily devolved. It is a pity that there are not more writers and speakers among the well-trained elementary teachers.

(5) Its object is to introduce new spirit. One is impressed, in the various expressions coming from many parts of the country, with the universality and unanimity of the nature-study movement (whether so named or not), indicating the existence of a general feeling that the schools are not adequate and not vital.

(6) The nature-study teaching has introduced many new and significant phrases into the teacher's vocabulary, as, for example, "increasing the joy of living," "sympathetic attitude toward nature," "increased interest in the common things," "to train the creative faculties."

(7) The end of nature-study is to develop spiritual sensitiveness and insight; therefore it must not cease with mere objects and phenomena. In this it differs from the prevailing conception of science-teaching. This attitude accepts phenomena as real, and regards what we call "progress" to be really such. It accepts the world as good. It does not depreciate the need and importance of introspection, but regards introspection and meditation as exercises for a mature and maturing mind, and holds that such exercise is most effective when most closely related to experience. Nature-study is not merely objective if it is developed in the way in which it should be developed. If we develop first the meditative, passive, and subjective habit, then we are oriental; but the spirit of the West is to live actively with the world.

(6) *Methods of nature-study.*

A study of the various statements in the syllabi of methods of nature-study teaching warrant a number of conclusions.

The methods are coming to be somewhat concrete because the motive is being understood. The motive of nature-study work is reaction from formalism; it is revulsion against the introduction of technical laboratory methods at a too early age; it is revolt from the spirit of the grown-up scientists as applied to elementary educational work. Yet, it has methods and standards of its own.

(1) What method there is in the work is characterized by personal interest. It embodies the spirit of individuality, spontaneity, enthusiasm. It is essentially informal and undogmatic. It arouses human interests. Customary educational procedure seems to be to try to make children as like as two peas. This procedure accounts for much of the prevailing deadness of school work. Individuality and personality, however, are the primary considerations in education, and the nature-study method aims to develop them. It puts a premium on original modes of apprehending knowledge. It develops personal responsibility and initiative. All this, of course, reacts on the teacher, developing originality and individuality in him. Syllabi, for example, are not final, but merely suggestive. This fact — that syllabi and books are only outlines—is one important reason why nature-study is so difficult to handle. Each teacher must rely on himself.

(2) In practice, nature-study makes use of many modes of expression, as in action, writing, speaking, drawing, color, music. It also leads to a fine feeling for poetic interpretation.

(3) These ways of procedure tend to make the school a unit instead of a mere assemblage of classes. They break up the monotony and formality of the curriculum, and tend to give the school an expression of naturalness. They add variety and vividness. Nature-study should correlate all school work. It puts a new motive and meaning into the school by making the school real and giving the teaching local application. It works from the child out to the school, to the parents, and to the community.

(4) Nature-study practice broadens the meaning of schooling. Consider the scope and breadth of the subjects that it touches: plants, animals, weather, the sky, fields and soils, health, home, affairs. The fact that so many subjects are touched is one reason why teachers of science are likely to disparage nature-study, for these teachers pursue one subject continuously for a considerable time and in much detail; but the science-teaching of the college and the best high schools must not dictate the subjects and methods of the elementary schools. No one teacher is likely to cover all the subjects coming within the denomination of nature-study. The fact that so many subjects fall within its sphere allows of all the more choice, and thereby adds all the more to the spontaneity and significance of school.

(5) The nature-study method marks the final rise of the school-garden as a central means in elementary school work. This is likely to be the pivot about which personal nature-work revolves, because it is near at hand, concrete, and controllable. It is the laboratory from which many enterprises diverge. In time it will come to be regarded as one of the essential parts of any school. It provides relevant laboratory work; and no school, from the kindergarten to the university, is a good school unless it has laboratory work. Kindergarten-work, manual-training, nature-study, all are laboratory work.

It is interesting to note the taming influence that a school-garden has on restless and truant children. Very often a pupil that cannot be interested by any other means becomes at once subdued if he is put at work in a good school-garden. The psychology of this seems to be that the garden furnishes employment for restless and superfluous energy; it also interests the child because it deals with real things. It touches experience and affections. Sometimes it holds the child because it develops a sense of responsibility and proprietorship; and there are those who think that it gives expression to an inborn longing to return to the wild. It is a common mistake to offer school-garden work as a reward to the best scholars. This is often dictated by the desire to have good-looking school-gardens. The aim should be to develop the child rather than the garden. The poorest scholars may be the very ones that most need school-gardening and will most profit by it; and the poorest school-garden may be the best. The school-garden is to be a means of developing personality.

The school-garden will evolve out of the specimen-plot method in many communities. Experiment-plots and test-plots will be introduced; in the rural districts the crops of the region will be grown in order that they may be studied.

(6) The methods of nature-study tend to connect the school with the home. The school becomes a social force. In many cases the individual school-garden may be in the home grounds rather than on the school grounds; it may, in fact, be a part of the regular home garden.

(7) We may sum up this review of methods by saying that the teaching begins with the actual, the tangible, the significant. It does not begin with classifications or systems, or with the idea of giving the child a complete view of a subject. It deals with the concrete. The pupil will gather experience and gain wisdom, and finally come to systematic knowledge. We shall not teach merely for the purpose of giving information: that can be got in a book. In the elementary grades in a country school, we shall do far better to teach the raising of a crop of corn, or the making of butter, than the principles of tillage, of soil fertility, or the theory of feeding cows. We should teach mostly by specific cases and examples.

Possibly in the high schools we can begin to teach principles of soil fertility and cattle feeding, but there is danger of going too far in these abstractions even there. Some day the high schools will prepare for colleges of mechanic arts and agriculture as consciously as they now prepare for literary colleges. It is a question whether the proper demarcation between the high school work and the college work will not then lie in the school dealing with actual problems and the college dealing also with the theories and the classified science. The syllabi for agriculture in high schools may err in covering the same ground that college courses cover, only in a more elementary way. They would do better to confine themselves more closely to special problems that mean something to the pupil and the community. It is not at all necessary that the high-school pupil should "develop a subject" or have "a body of knowledge." Much of the present high-school work is far beyond the pupil. The people have always asked for concrete knowledge and training.

It is a question whether nature-study and crafts subjects should be taught in the grades merely to illustrate or vivify some literary text or story. For example, it is not worth while to exemplify Robinson Crusoe by studies of dogs and parrots and the making of canoes. These things are really extraneous, after all, and a kind of acting. It is a question whether it is profitable for a mere child in the grades to build canoes unless it comes naturally, as a part of personal experience. The object-work to illustrate literature lessons subordinates the meaning of the object; and the effort might much better be expended on objects for their own sakes, and that have relation to experience, letting literature be taught in some other way.

Results to be expected from nature-study in country schools.

Persons are always asking for the results of the nature-study work, as if they expect that statistics can be given in reply. They want to know how many teachers are teaching it, how many children are interested in it, how many school-gardens there are, how many syllabi are in use, how many pupils are enrolled, and the like. All this is well in its way, and is important, although the results of nature-study are not to be measured by these formal means, but, rather, by a general elevation in the mode and tone of the school, and in the point of view of the community.

If this experience-teaching is fundamental, one must not look for results quickly. Spiritual movements proceed slowly. It may require a generation yet to take us out of the habit of teaching merely the names of things.

It has been said that the current movement toward nature-study is misdirected, since all human activities proceed from experience. Language, for example, is only a means of expressing experience; therefore Greek study is nature-study. The evolution of a language, however, is the experience of a race; what we now argue for is the using of the experience of the individual. Of course no one would advise against the use of race-experience, as expressed in language and literature; but education should begin with the person, which is the concrete.

It is said, also, that the common work and duties that children perform, as, for example, on the farm, develop the individual, and are really educational. This is true; but this common work may be made much more educational by being systematized, directed, and vitalized. In time, even the out-of-school duties of the child will be touched, perhaps even directed, by the school. We must distinguish between manual labor and manual-training.

It is a fallacy to consider that nature-study must be merely correlated with the present school subjects except as a means of starting and establishing its spirit. Nature-study teaching is a way of conducting the school work so that it will have personal application and meaning.

The school must be given a new purpose or expression. Our school systems are now really developed for the few—for those who are "good scholars." Other pupils are expected to emulate these few, whereas they may have a wholly different order of ability. When education becomes personal, all this will change. The new teaching goes deeper than the adding of a subject to the course, deeper than merely to be "correlated with." It is quite the opposite of "correlation with," as if it were applied from the outside; it is giving direction to, making application of.

Just now, nature-study is the stepping-stone to the introduction of agricultural studies. This is an indication that it is a means of connecting the school with the real life and activity of the community; but nature-study is a means of preparing the pupil for all kinds of school work and for all places, as well as for agriculture and for the country. As the schools develop, we shall find that we shall not need to introduce agriculture as a separate study, even in rural districts, at least not below the high school, for in such districts the whole school effort will have an agricultural, country-life, or nature-study trend.

In time, the beginning schools will probably not teach any of the present-day subjects under their present names; but this will adjust itself in the natural course of evolution. The greatest present need is to reorganize the teaching of the subjects that are already in the country schools.

Geography, for example, will deal first with the local country and its affairs. Of course the methods have changed greatly in a generation; but the old geography was largely of a ballooning variety, beginning with the universe and descending through the solar system to the earth. If the school is in the open country, it may give attention to fields, birds, soils, brooks, forests, crops, roads, farm animals, hamlets, and homes. Geography can be so taught in the schools as, in ten years, to start a revolution in the agriculture of any commonwealth.

Arithmetic needs redirecting in the same spirit. The beginnings of a new motive are now becoming prominent. The principles of number are the same wherever taught, but practice problems may have local application. These problems have heretofore dealt with theoretical, urban, middleman, co-partnership subjects, and sometimes have been mere puzzles. It is significant that the arithmetic problems that the country child takes home do not interest the old folks. This is only because the problems mean nothing to them. Many of the problems of the farmer are numerical—soil moisture, fertility problems, feeding rations, spraying, cost of labor and of producing crops, and all manner of accounts. Number can be so taught in the schools as, in ten years, to start a revolution in the agriculture of any commonwealth.

Reading needs similar reorganization. This is everywhere recognized, and distinct progress is being made. It is not desirable to eliminate the customary types of literature of the masters; but something may be added to make the reading vital and applicable. It is possible to find good pieces of English composition that deal with the customary practices and affairs of the open country, and that point the way to better things. Reading and spelling can be so taught as, in ten years, to start a revolution in the agriculture of any commonwealth.

Even manual-training needs new direction as it touches country life. It may not be necessary to eliminate the formal exercises of model work and weaving and the like; but the practical problems of the home and farm may be added. How to make a garden, to lay out paths, make fences and labels, are manual-training problems. How to saw a board off straight, to drive a nail, to whittle a peg, to make a tooth for a hand hay-rake, to repair a hoe, to sharpen a saw, to paint a fence, to hang a gate, to adjust a plow-point, to mend a strap, to prune an apple tree, to harness a horse,—the problems are bewildering from their very number. Manual-training can be so taught in the schools that are equipped for it as, in ten years, to start a revolution in the agriculture of any commonwealth.

All such teaching as this will call for a new purpose in the school building. The present country-school building is a structure in which children sit to study books and recite from them. It should also be a place in which children can work with their hands. Every school building should have a laboratory room, in which there may be a few plants growing in the windows, and perhaps an aquarium and a terrarium. Here the children will bring their flowers and insects and samples of soil, and varieties of corn or cotton in their season, and other objects that interest them, and here they may perform their simple work with tools. Even if the teacher cannot teach these subjects, the room itself will teach. The mere bringing of such objects to school would have a tremendous influence on the children: patrons would ask what the room is for; in time a teacher would be found who could handle the subjects pedagogically. Now we see children carrying only books to school; some day they will also carry twigs and potatoes and animals and stones and tools and contrivances and other personal objects.

The plea, therefore, is that the school accept all wholesome conditions in which it is placed, and that it begin with the sphere in which the child lives, then lead it out to the world activities as the mind develops. The working out of this philosophy is nature-study; and this philosophy goes deeper than mere manual-training, or than arts and crafts studies, or than bare "self-activity." Nature-study is not another subject, not something external or added to. It is a means of education, internal, central, essential, fundamental. In time nature-study agriculture will be as much a part of the country school as oxygen is a part of the air.

The higher grades. (See also page 471.)

We have been speaking of the necessity to redirect the schools, and explaining that the nature-study attitude will be the means of bringing this direction about. In the school work below what we now know as high-school grade, it will not be necessary to organize special classes in agriculture, if the school is once redirected. In the high school, regular classes in agriculture may well be introduced, and the work should be comparable in quality with the best physics and the best biology.

But even in the high school, the nature-study method is essential,—the purpose to study the things and phenomena themselves, just as they are. There is also as much need of this purpose in college work as in elementary teaching; and, in fact, it is often highly developed there, particularly in colleges of agriculture.

Whether the high school or academy can give a satisfactory course in agriculture, depends almost wholly on local conditions. We are undoubtedly coming to departmental schools: in some places the mechanic department will be highly developed, in others the home economics, in others the commercial, and in others the agricultural. It will require time to develop them, and more funds than are now at the disposal of the public high schools. Very much can be done in the best conditioned high schools by the introducing of a class in agriculture, but the real satisfaction will come under something like a departmental organization.

Some of the regular high schools in particular agricultural regions will develop practically into agricultural schools. Some of the new township and county high schools show this tendency. The greater number of high schools, however, will teach agriculture as an incident to a general course of study. In many cases, a special teacher will be provided; in other cases, the science teacher will handle the agricultural work. School-gardens will be provided in many places, either on the school premises or at the pupils' homes; in the high school, these will gradually develop into laboratories of a higher grade than the present school-gardens, so that they will be comparable in effort with other laboratories. In some places, small farms will be added to the high school equipment. As education develops, the regular farms of the neighborhood will be used in the teaching. Much effort has been expended in suggestions for agriculture teaching of an elementary grade, but relatively little for work of secondary or high-school grade.

The high school must be less completely given over to the preparing of students for college. There must be more courses of study that do not look toward college entrance. On the part of colleges, more latitude must be given in entrance requirements. The liberalizing of entrance requirements must keep pace with the liberalizing of the college curriculum.

Not only must the high school, or some equivalent institution, handle the subjects that the community needs, but it must provide short and condensed courses. The differentiations now proceeding in the leading colleges of agriculture may be taken as suggestions of methods that must be applied, in some minor degree, in institutions of high school grade.

The enlargement of the motive of the high school will call, of course, for better financial support. A simple book-course or laboratory-course in agricultural subjects can be introduced without much extra cost if the school already has a good science teacher who can handle the work. A special assistant to such a teacher may be secured for $400 and upward. An independent teacher of agriculture may be secured direct from a college of agriculture for $800 to $1,000; but this salary will have to be quickly increased if the man develops good abilities, else he will be taken by government service, or a college, or he will go into business for himself. Such a teacher should have the use of a few hundred dollars for equipment and outdoor work. If a regular department of agriculture is organized in a first-class high school, an expenditure of $5,000 a year will be needed to put it beyond the danger of failure.

II. Special Secondary Schools of Agriculture

From the earliest discussion of industrial education in North America, many persons have advised that special schools be established for the teaching of agriculture. We have seen that many schools of this kind were organized in the early days. Most of these had ceased to exist by the time the Land-Grant colleges began to be established. Forty years was given to the development of these colleges, before the agitation for secondary schools in agriculture began to revive to any extent. We are now in the midst of a wide-spread movement for such institutions. The movement is part of the general agitation for technical and vocational schools.

These special schools for agriculture, if well conducted, will admirably serve the needs of pupils of special tastes, but they will not supply the coming demand of all the people for education in terms of life: this demand must be supplied by the public school system (page 467), and those pupils who desire to go further will naturally seek the special and separate schools.

The special schools of agriculture that are now organizing are supported by public money. They are expensive. They cannot be increased to the extent of meeting the needs of all the people for education; or, if they should be so increased, they would supplant much of the present public-school system,—a result, in fact, to be desired if the public schools do not meet the situation. We undoubtedly need to establish a certain number of special separate schools for agriculture. Thereafter, states will find themselves subsidizing or aiding agriculture teaching in regular high schools here and there, and finally this will come to be general practice; that is, the states will appropriate more money to public schools, and in the nature of grants for specific kinds of work.

Kinds of special schools.

There are as yet no recognized systems of special schools for agriculture and related methods. There are isolated schools here and there, supported by states or counties, more or less endowed by individuals, maintained or aided by societies. These are widely scattered, and are more numerous than we are aware. Aside from these (and not counting high schools with strong agricultural proclivities), we may distinguish four types of development: (1) the Alabama-Georgia type, with a school in each congressional district and supported mostly by tax on special commodities; (2) the Wisconsin type, with a school in each county (eventually), supported in part by the state and in part by the county; (3) the New York type, with schools here and there, at present tending to associate with the established institutions of higher learning, and heavily endowed and equipped by the state; (4) the Minnesota type, with a highly organized school in connection with the Land-Grant college.

It is not the purpose of this writing to mention all the schools of agriculture or even all the states that are now organizing such schools; but enough will be said to convey an idea of the types.

The Alabama-Georgia plan.

The Alabama schools are nine,—one for each congressional district. They are established on a legislative act of 1897, although certain of the schools are much older than this. The object of the schools is stated as follows:

"Scientific and practical agriculture shall be taught at all the Agricultural Schools, and all male pupils over ten years of age who receive free tuition therein shall be required to take the course in scientific agriculture and horticulture, and all other pupils over the age of ten years, receiving free tuition, shall be required to take the course in floriculture and horticulture.

"The Board of Control and the President of the Faculty of said schools shall adopt a course of study with a view to educating and training pupils for teachers in the public schools of this State, which course of study shall embrace the different grades adopted by the State; to grant certificates of proficiency or diplomas to such pupils as shall complete the course of study so adopted; provided, that such certificates of proficiency or diplomas shall not entitle the holder to teach in the public schools in this State without examination."

The Alabama schools are supported by the tag tax on fertilizers sold in the state, and by fees. Until very recently, each school received an annual appropriation, from the proceeds of the fertilizer tax, of $2,500, of which $500 was to be spent on the farms and experimental work. The fees amounted to about one thousand dollars a year. At present (1908), these schools each receive $4,500 from the state, of which $750 must be used for the farm and experimental work. About $1,500 is received from fees. The schools are related to the Land-Grant college of the state. The curriculum is the same for all the schools, and is arranged by a general board or committee, of which the Governor and Superintendent of Education are members. The Commissioner of Agriculture and Industries is president of these schools. The schools provide a general four-year course, with agriculture a part of it. Each school has a farm and an experiment station, in charge of the teacher of agriculture.

The nine district agricultural schools and experiment stations in Alabama are located as follows:

First district, Jackson; second district, Evergreen; third district, Abbeville; fourth district, Sylacauga; fifth district, Wetumpka; sixth district, Hamilton; seventh district, Albertville; eighth district, Athens; ninth district; Blountsville.

In Georgia, eleven district agricultural schools were established by act of the legislature of 1906. Each school will now receive $7,500 annually, the funds being derived from inspection fees on ferti-

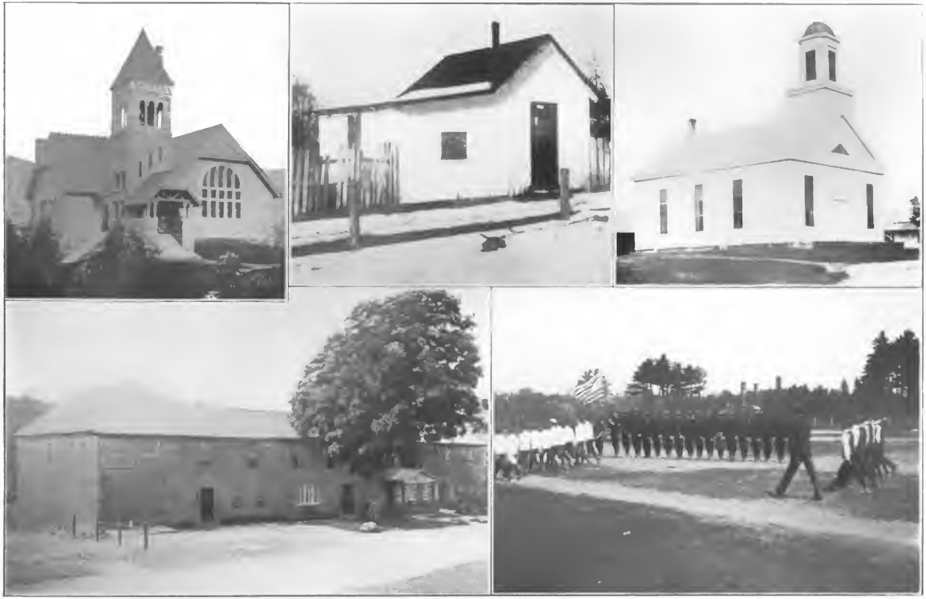


Plate XXI. Rural religious social work. Upper left, Union church, Proctor, Vermont, eleven denominations; upper center, headquarters County Department Young Men's Christian Association, in a Virginia town; upper right, an old-time country church; lower left, county settlement house in New Hampshire; lower right, competition drill of military organization of a country church.

lizers and illuminating oil, collected by the State Department of Agriculture. The schools have been located with reference to the coöperation of the people, the community being obliged to furnish not less than 200 acres of land and the necessary equipment.

The agricultural schools in Georgia are affiliated with the College of Agriculture of the State University. The general Board of Trustees of the University exercise such supervision as in their judgment may be necessary to secure unity of plan and efficiency in the schools.

The act provides "that the course of study in said schools shall be confined to the elementary branches of an English education, and practical treatises and lectures on agriculture in all its branches, and the mechanic arts and such other studies as will enable students completing the course to enter the Freshman class of the state college of agriculture on certificate of the principal."

The location of the Georgia schools, together with the approximate extent of the coöperation of the community, is as follows (the lights, water and sewerage are valued at about the cost of same, and the land is estimated at the market value):

First District, Statesboro.—Sixty thousand dollars cash; 300 acres of land, $20,000; electric lights, water and sewerage, $20,000.

Second District, Tifton.—Donations same as first district, except market value of land probably $30,000.

Third District, Americus.—Forty thousand dollars cash; 300 acres of land, $20,000; lights, water and sewerage, $15,000.

Fourth District, Carrolton.—More than thirty thousand dollars cash; 300 acres of land, $15,000; lights and water, $15,000.

Fifth District, Monroe.—Thirty-one thousand dollars cash; 250 acres of land, $10,000; lights and water, $15,000.

Sixth District, Barnesville.—Fifty-one thousand dollars cash; 300 acres land, $20,000; lights and water, $15,000.

Seventh District, Powder Springs.—Academic building and boys' dormitory, according to architect's plans, $28,000; 240 acres of land, $12,000.

Eighth District, Madison.—Forty thousand and five hundred dollars cash; 300 acres land, $20,000; lights and water, $15,000.

Ninth District.—School not yet located.

Tenth District, Sparta.—Forty-seven thousand dollars cash; 250 acres land, $10,000.

Eleventh District, Douglas.—Fifty-five thousand dollars cash; 300 acres land, $20,000; lights, water and sewerage, $15,000.

The Wisconsin schools.

In 1899 the Wisconsin legislature appointed a commissioner (L. D. Harvey) to investigate and report upon the methods of procedure, in this and other states and countries, in giving instruction in manual-training and in the theory and art of agriculture to the public schools. Among the recommendations in the report was one for the enactment of a law authorizing counties to establish secondary schools of agriculture and domestic economy. The legislature, in 1901, enacted a law providing for such schools and proffering state aid to the first two schools thus organized. In 1902, two schools of this class were established; one in Menomonie, Dunn county, and the other in Wausau, Marathon county. There was a good attendance at the opening of each school, which has steadily increased each year. The legislature of 1903 increased the number of schools entitled to state aid to four, increased the amount of aid in each case, and authorized two or more counties to unite in establishing and maintaining a school. At present, similar schools are established at Winneconne, Winebago county; Marinette, Marinettie county; Grand Rapids, Wood county; La Crosse, La Crosse county; and the agitation has spread to other counties.

Following is an outline of the Wisconsin law creating and assisting county schools of agriculture and domestic economy (Chapter 288 of 1901, as amended in 1903):

Sections 1, 2 and 3 create the schools of this class and provide for county school boards of three members. Section 4 allows two or more counties to unite in one school. Section 5 makes the county treasurer the school treasurer. Section 6 names branches to be taught. Section 7 requires a plot of three acres for farm practice. Section 8 makes the school free to students in any county helping to support such school. Section 9 makes the state superintendent also superintendent of such schools. Section 10 provides for list of four such schools when approved by the dean of the College of Agriculture and the state superintendent. The cost of maintaining a school is to be reported to the state superintendent. The school must be maintained eight months. The state shall pay each county maintaining such school "a sum equal to two-thirds the amount actually expended for maintaining such school during the year, provided that the total amount so apportioned shall not exceed $4,000 to any one school in any one year."

The Wisconsin schools have now made greater headway than any independent secondary schools of agriculture and domestic science in the United States. The state also has a system of county normal schools, sixteen schools being in operation and four more in process of organization. In Menomonie, Wausau and Marinette, the county normal school is in the same building with the county agricultural school; and the instructors in the agricultural school give the normal school pupils instruction in agriculture, and those in the normal school give the others instruction in teacher's subjects. This coöperation is proving to be of the greatest value.

The county plan, of one kind or another, seems now to be most in favor. Several states are moving in this direction. In 1903, for example, the Minnesota legislature provided for the establishment of county schools of agriculture and domestic science, limiting the sum that any county may appropriate in any year to $20,000. Two or more counties may unite in the establishing of a school.

The development in New York.

Following a contest in the state of New York respecting agricultural education, in the winter of 1903–1904, the New York State College of Agriculture at Cornell University was established. The interest aroused by this contest did not abate, and in 1906 the legislature established a "State School of Agriculture at St. Lawrence University" at Canton, New York, and appropriated money for the erection of buildings. In 1907, an administration act was passed and money was provided for the maintenance of the school. This school opened to receive students in 1907, and the general appropriation bill, which became a law May 2, 1908, appropriated $17,500 for annual maintenance. The state has appropriated nearly $140,000 for the erection of buildings and the purchase of equipment. The purpose of the school as expressed in the general administration law, 1907, is as follows: "The object of such school of agriculture shall be to improve the agricultural resources of the state in the production of crops of all kinds; in the rearing and breeding of live-stock, in the manufacture of dairy and other products, in determining better methods of handling and marketing such products, and in other ways to increase intelligence and elevate the standards of living in the rural districts." This school is wholly under the management of the trustees of St. Lawrence University and has no organic connection with the State Education Department, State Department of Agriculture, or the State College of Agriculture.

The legislature convening January, 1908, established two other schools of agriculture. One is "A State School of Agriculture at Alfred University," and the other is a "A State School of Agriculture at Morrisville, Madison county." These schools are authorized to give elementary and practical instruction in agriculture and kindred subjects, and to conduct experiments and investigations in the agricultural methods and resources of their respective regions. The work is to be coördinated, as far as practicable, with that of the New York State College of Agriculture at Cornell University. The State Commissioner of Agriculture and the Director of the New York State College of Agriculture, as well as a representative of the State Grange, are ex officio members of the Board of Managers of these schools.

The sum of $75,000 was appropriated for buildings and equipment for the school at Alfred, and an initial appropriation of $5,000 for the maintenance of the school for the first year. The Morrisville school is unattached to any institution. The county seat is to be removed from Morrisville and the county buildings are to be used for the school. The state appropriated the sum of $20,000 for altering, equipping and maintaining the buildings.

These New York schools are probably the most expensively equipped and endowed of any secondary schools of agriculture in this country, not connected with Land-Grant colleges. The schools of St. Lawrence University and Alfred University are also probably the only examples in North America of state-maintained secondary or special schools of agriculture attached to liberal arts universities.

The Minnesota plan.

The School of Agriculture at St. Anthony Park has attained great prominence and renown. It has had much influence in fitting persons for actual farm life. Opened in 1888, it has grown to college dimensions, accommodating about 600 students. "It is the aim of the school of agriculture to train its students to become useful citizens as well as good farmers and housewives." It offers a "practical course of study designed to fit young men and women for successful farm life, and it provides an intermediate year for those who wish to enter the college of agriculture."

The school year runs from October to March. A three-year course is provided. Much of the work is taken in common by the young men and the young women. Some of the subjects, such as blacksmithing, carpentry, field work, handling grain and machinery, are taken by the young men, while the young women pursue cooking, sewing, laundering and household art. The methods of instruction tend to educate students toward the farm, and to develop in them a love for farm life by showing them its possibilities. In this respect the school has been very successful, as over 80 per cent of its graduates continue agricultural pursuits.

All male students are required to have had six months farm practice before entering the school. Parents are advised not to send pupils under fifteen years of age, unless they are unusually porficient in the common branches. Students who have completed eighth-grade work in the common schools are admitted without examination. Applicants for admission who do not have state certificates or county diplomas showing completion of eighth-grade work should send to the registrar for certificates of admission which, when properly filled out by former teachers or superintendents, will be accepted in place of entrance examinations. Applicants whose home schools do not afford complete instruction in the common branches may be admitted with not more than two conditions, which must be removed according to instructions given the student. Students from city or grade schools will not be admitted before finishing eighth-grade work, nor until their former school records have been passed upon by the registrar. These records must be presented at least three weeks prior to the opening of the school. State High-School Board Certificates are accepted for work in English, physiology, algebra, geometry and civics.

The requirements for graduation from the Minnesota school are: First, the completion of the prescribed course of study, with an honorable standing in deportment; second, an essay of not less than one thousand words upon a topic connected with agriculture or home economics; third, for young men, a practical experience in field work at the University farm or elsewhere, as shall appear in reports from responsible sources.

The School of Agriculture is a part of the Department of Agriculture of the University of Minnesota. This Department consists of the College of Agriculture, the School of Agriculture, the Dairy School, the Short Course for Farmers, and the State Experiment Station. The officers of the School are also officers in the College.

There is a similar school in connection with the University of Nebraska, and one at the College of Agriculture in South Dakota. There is a similar school in California, at Davisville, but under the direction of the College of Agriculture.

III. THE TRAINING OF TEACHERS FOR SECONDARY AGRICULTURE

The elementary agriculture work is general nature-study. In the intermediate grades, it may begin to get hold of the affairs of agriculture in the neighborhood. [See Report of Committee on Industrial Education in Schools for Rural Communities, National Educational Association, 1905.] In these grades, a separate teacher of agriculture, as such, will not be required.

In the high schools, and other schools of similar grade, special teachers of agriculture will be needed, and, for the most part, they are not yet to be found. Teachers will prepare themselves for this mode of teaching as soon as good positions are open, but they must have opportunities to secure the preparation. One cannot teach agriculture unless he knows how.

The Editor has discussed what seem to him to be the ways of training teachers for this work in Bulletin No. 1, 1908, of the United States Bureau of Education, from which brief extracts may be made. We must distinguish between aiding teachers who are already in service to "get up" the agricultural work, and the training of new teachers for this field. The means at the service of these two classes of teachers are as follows:

(1) Aids to teachers already in service.
   - (*a*) Summer schools.
   - (*b*) Regular teachers' institutes.
   - (*c*) Lectures.
   - (*d*) Correspondence and leaflet work.
   - (*e*) Short course in agricultural colleges (page 447).
   - (*f*) Peripatetic teachers.
   - (*g*) United States Department of Agriculture.

(2) Means for the training of new teachers.
   - (*a*) State normal schools.
   - (*b*) Local normal schools.
   - (*c*) High schools and training classes.
   - (*d*) Separate agricultural schools.
   - (*e*) Special foundations.
   - (*f*) Education departments and teachers' colleges.
   - (*g*) Colleges of agriculture.

We may throw these normal agencies into something like a classified system, and indicate the main lines of a rational procedure:

(1) The elementary schools demand general teaching. Not much that is named agriculture is possible with the pupils of elementary school age, but nature-study and the industrial spirit should constitute the foundation of their work. The district rural schools are elementary schools. They pay small wages and offer few attractions to teachers. For the most part they are able to secure the services only of those persons who are on the way to other employment. Their teachers are mostly women. Until these conditions change, the rural schools must draw their teachers chiefly from the region of the high schools. Whenever good science work is an important part of the high school course of study, and particularly when good agriculture teaching is also introduced as a regular part of the curriculum, a training class in connection therewith and requiring a high school diploma for the completion of the work, should be able to make great progress in preparing teachers for the elementary grades. Some of the teachers for the grades will be recruited from the ranks of those who do not complete normal school courses. In the end, special local means or institutions must be provided for the training of these teachers, and it is time that this were recognized. At present, however, it may be repeated, it is incumbent on the secondary school region to train the teachers for the elementary region.

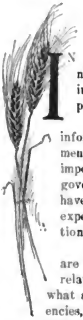
(2) The teachers who are to train these elementary teachers must themselves be trained. They must have real preparation, if the agriculture teaching is to be of permanent value; they can not be trained in the common teachers' institutes or by other mere short-cuts. The teachers of this secondary normal work must be trained in institutions where genuine agriculture is established; some of the state normal schools may provide this work; some of the special separate schools of agriculture may provide it; some of the education departments or teachers' colleges in association with agricultural departments of higher institutions, may provide it; the agricultural colleges will be obliged to provide it. The best trained and best adapted of the graduates of the colleges of agriculture, however, will find better openings than most schools of the secondary region are at present willing to pay. The preparation of such teachers should include general scholarship and training in the principles of education, as well as specialized scholarship in agriculture and other industrial work, and sufficient hand practice to give command of the technique of instruction.

(3) If the regular agriculture teachers of secondary schools and the teachers of secondary training classes are to be prepared in the state normal schools, then these normal school teachers must themselves be trained in agriculture. Their training must be more than can be secured in the normal school itself. They may be trained in education departments of universities and in teachers' colleges, provided always that these institutions are associated with real agricultural work; or they may be trained in the agricultural college itself.

(4) The agricultural college necessarily stands at the head of the system. It holds the key to the situation. It must provide the leaders.

CHAPTER IX

GOVERNMENTAL AND LEGAL AID AND CONTROL



IN AID OF THE FARMER, governments establish executive departments, and states and nations pass laws. It is the business of government to see that injustices, inequalities and irregularities are reduced to a minimum for all the people, and to see that the people are put in the way of securing such information as will enable them to help themselves.

In respect to governmental influence in education, research, and dissemination of information, great advancement has been made in North America. The United States Department of Agriculture operates on such a large base that its activities are now among the most important and far-reaching functions of modern government, setting an example to the governments of the Old World. The governments of the individual states, for the most part, have not developed so far in their respective spheres, but greater activity on their part may be expected. Much of this work has direct legal aspects, and it may well be discussed in connection with a consideration of the body of agricultural law.

In North America, however, there are no nationalized bodies of agrarian law. There are very many highly developed statutes of an agricultural nature, but much is needed to relate and unify them. There seems to have been very little study of the general philosophy of what such laws should be. Something like codification of them should bring out the inconsistencies, develop the weaknesses, and suggest useful lines of constructive legislation.

In this chapter, it is the purpose to explain what the government is doing directly to aid agriculture, and then to present statements of some of the more important and bolder laws affecting agricultural welfare in the United States and Canada, and to suggest what seems to be most needed in the way of more effective statutes. There is no effort to treat the legal subjects from the standpoint of "every man his own lawyer." This whole statutory field needs investigation by some one who approaches the subject from the point of view of evolution of institutions as well as from that of the practice of law.

GOVERNMENT SERVICE FOR AGRICULTURE IN THE UNITED STATES

By *A. C. True*

Very soon after Englishmen began to establish colonies in what is now the United States, some government aid was extended to agriculture. The breeding of silkworms in Virginia was encouraged by James I, in 1622; premiums for sheep-raising were offered by the general court of Massachusetts in 1642; and the raising of crops was stimulated by similar action of the Virginia legislature in 1657. The cultivation of indigo and other crops in Georgia was promoted by parliamentary grants, amounting to the very considerable sum of $600,000 in the ten years preceding 1743. About this time, Parliament several times took action with a view to establishing silk-culture in the colonies, and "in 1766 the South Carolina assembly voted £1,000 for the establishment of a silk filature in Charleston." Benjamin Franklin, as the agent of Pennsylvania in England, sent to his people at home silkworm eggs and mulberry cuttings. The opening of the Revolution found the South Carolina and Virginia legislatures encouraging the sheep industry.

After the independence of the colonies had been recognized, one of the first practical efforts to heal the breach between England and the United States was the appointment of President Washington as an honorary member of the British Board of Agriculture, on its establishment in 1793. This was followed by Washington's suggestion to Congress in his last message, in 1796, that it would be well to establish a similar board under United States authority. From the very beginning of our National government, our consuls and naval officers were encouraged to send home information and materials for the benefit of our agriculture. During Washington's second administration, Barbary sheep were brought over from Tunis in a naval vessel, and in 1810 thousands of Merino sheep were procured for Americans by our consul at Lisbon. In a similar way, Chinese and French hogs were introduced here early in the nineteenth century. In 1826, Congress authorized the publication on the growth and manufacture of silk, prepared by Richard Rush, Secretary of the Treasury, and, in 1828, Count Von Haggi's "Treatise on Rearing Silkworms" was printed as a congressional document.

In 1836, Henry L. Ellsworth, of Connecticut, Commissioner of Patents, distributed among our farmers considerable quantities of foreign seeds and plants. Three years later, he secured from Congress an appropriation of $1,000, "for the purpose of collecting and distributing seeds, prosecuting agricultural investigations and procuring statistics." The Patent Office continued this work for over twenty years, extending it as fast as increased funds would permit. [See Vol. II, p. 70.]

Service of the United States Department of Agriculture.

On May 15, 1862, an act of Congress was approved by President Lincoln which created a separate Department of Agriculture, and Isaac Newton, chief of the section of agriculture in the Patent Office, was made the first United States Commissioner of Agriculture. The succeeding commissioners were Horace Capron, Frederick Watts, William G. LeDuc, George B. Loring and Norman J. Colman. During this period, the statistical, chemical, botanical and entomological work of the Department was greatly enlarged and the Bureau of Animal Industry was established.

On February 9, 1889, President Cleveland signed the act raising the Department to the first rank in the Executive Civil Service, and giving its administrative officer a seat in the President's Cabinet. Commissioner Colman thus became the first Secretary of Agriculture. He was succeeded in a few weeks by Jeremiah M. Rusk, and he in turn, four years later, by J. Sterling Morton. The present Secretary, James Wilson, was appointed by President McKinley March 5, 1897. During his long administration, both the scientific and administrative work of the Department has been very greatly increased in variety and extent. Within the ten years ending with 1907, the appropriation for this Department has increased from about $2,500-000 to over $11,600,000, and the number of employees from 2,444 to 9,107. The general business of the Department is conducted through the office of the Secretary, to which are attached the Assistant Secretary, Chief Clerk, Solicitor, Appointment Clerk and Chief of the Supply Division. The Department is further divided into nine bureaus, two offices, two divisions and the library.

Weather Bureau.—Beginning early in the nineteenth century, meteorological data were collected and published by the Smithsonian Institution, and several departments of the United States government. In 1870, provision was made for daily weather reports in connection with the signal service of the army, and, twenty years later, the Weather Bureau was transferred to the Department of Agriculture. Its daily weather forecasts are based on observations made at about 200 subordinate meteorological stations, and by over 3,600 voluntary observers. It also has about 255 stations especially equipped for the display of danger warnings to mariners, more than 400 river-gauging stations and 107 special rainfall stations in the various watersheds. It makes many scientific investigations on meteorological subjects, with a view to establishing the laws that govern weather changes and that will aid in perfecting its forecast system.

Besides the daily weather maps and numerous bulletins, the Bureau publishes a monthly journal called The Weather Review. Through an arrangement with the Post Office Department it sends daily forecasts to many farmers residing on rural mail-delivery routes, and, in some parts of the country, it has arranged so that farmers and others having telephones in their residences can get the daily forecasts by calling up the central telephone office.

Bureau of Animal Industry.—The Bureau of Animal Industry was established in 1884, and its most important early work was the stamping out of pleuro-pneumonia. At present, its most important service is the inspection of animals, meats, and meat-food products under the act of Congress of June 30, 1906. It also has charge of the inspection of import and export animals and of vessels for the export of cattle, and maintains quarantine stations for imported neat cattle, other ruminants and swine, and supervises the interstate movement of cattle. It makes investigations as to the existence of dangerous communicable diseases of livestock, superintends the measures for their control and extirpation, and makes original scientific investigations as to the nature and prevention of such diseases, as well as concerning the breeding and feeding of animals. It also makes special investigations on dairy subjects, inspects and certifies dairy products for export, and supervises the manufacture and interstate commerce of renovated butter.

Bureau of Plant Industry.—The Bureau of Plant Industry was formed in 1901, by bringing together the divisions of the department which dealt with subjects in botany, vegetable pathology, agronomy and horticulture. Its work has since been greatly increased, and now includes a great variety of scientific investigations and practical experiments and demonstrations on plant life in its relations to agriculture. It maintains an experiment farm at Arlington, Virginia, near Washington, and demonstration farms and experiment stations in different parts of the country. It conducts agricultural explorations in foreign countries, to secure plants and seeds for introduction into the United States. It has charge of the purchase and distribution of the seeds allotted to congressmen.

Forest Service.—A Division of Forestry was established in 1877, which was reorganized in 1901 as a Bureau of Forestry, and in 1905 received the name of Forest Service. The most extensive and important work of the Forest Service is the management of the national forests, which embrace 167,992,000 acres. For this purpose, a large corps of wardens, inspectors and workmen are employed. Forest planting is also conducted on an extensive scale, and practical assistance is given in the conservative handling of state and private forest lands and the methods of utilizing forest products. Various scientific and practical problems in forestry are investigated; tests are made of the strength and durability of construction timbers, railroad ties and telephone poles; methods of controlling and preventing forest fires are studied, and the effects of grazing on forest land are determined.

Bureau of Chemistry.—A Division of Chemistry was established in 1862, and reorganized as a Bureau in 1901. Its most extensive work is the examination of foods and drugs, to determine whether they are adulterated or misbranded within the terms of the so-called "pure food" act of Congress of June 30, 1906. The enforcement of this act has been entrusted to a Board of Food and Drug Inspection, consisting of the Chief of the Bureau of Chemistry, the associate chemist, and the solicitor of the department. Laboratories for the examination of foods and drugs have been established at Washington and in a number of other large cities. Experiments are made with human subjects to determine the effects on health and digestion of various food preservatives and coloring matters. There is also a wide range of chemical studies on sugars, oils, honey, dairy products, cattle feeds, waters, leather, paper, cereals, alcoholic liquors, and the like. A considerable amount of chemical work is done for other branches of the Department of Agriculture and for other departments of the government.

Bureau of Soils.—A Division of Soils, formerly a branch of the Weather Bureau, was established as an independent division of the department in 1894, and reorganized as a Bureau in 1901. It investigates, surveys and maps soils, studies the cause and prevention of the rise of alkali in soils and the relations of soils to seepage and drainage, and advises regarding the proper management of soils through improved methods of cultivation, crop rotation, and the intelligent use of fertilizers.

Bureau of Entomology.—A Division of Entomology was established in 1863, and reorganized as a Bureau in 1904. It studies injurious and beneficial insects in their relations to agriculture and to the diseases of man and other animals, and disseminates information regarding means of dealing with them. Insects are identified for experiment stations and other public institutions and for private individuals.

Bureau of Biological Survey.—A Division of Ornithology and Mammalogy was established in 1886; ten years later the name was changed to Biological Survey, and in 1905 the Bureau organization was effected. The Bureau studies the geographic distribution of animals and plants, and maps the the natural life-zones of the country; it also investigates the economic relations of birds and mammals, recommends measures for the preservation of beneficial and the destruction of injurious species, and is charged with carrying into effect the provisions of the federal laws for the importation of wild birds and other wild animals, and for the protection of game by control of interstate trade in game, and by other means.

Bureau of Statistics.—One of the earliest direct government services for farmers was the collection and publication of agricultural statistics, and as early as 1863 a Division of Statistics was established. The Bureau of Statistics was organized in 1904. It collects, through state and traveling agents, local reporters, correspondents, and a special foreign correspondent, information concerning the condition, production, distribution, consumption, of farm crops and animals, and disseminates through all the states and territories the more important results of its investigations by telegraph, by cards sent to all postmasters, and through an official monthly publication entitled the "Crop Reporter." One of the divisions of this Bureau has for its object the extension of the agricultural export trade of the United States.

Office of Experiment Stations.—The Office of Experiment Stations was established in 1888, and represents the department in its relations with the agricultural colleges and experiment stations, which are now in operation in all the states and territories, and directly manages the experiment stations in Alaska, Hawaii, Porto Rico, and Guam. It seeks to promote the interests of agricultural education and investigation throughout the United States. It collects and disseminates general information regarding the colleges and stations, and publishes accounts of agricultural investigations at home and abroad. It also reports on the work and expenditures of the stations, and furnishes them with such advice and assistance as will best promote the purposes for which they were established. It investigates and reports on the progress of the farmers' institutes and agricultural schools in the several states and territories, and aids in making such organizations more effective. It is also charged with investigations on human nutrition, and on irrigation and drainage and other phases of agricultural engineering, which are largely conducted in coöperation with the colleges. It publishes a monthly review of the world's literature of agricultural science in a journal called the Experiment Station Record, and popular summaries of the practical results of the investigations of the state experiment stations in a series of bulletins entitled Experiment Station Work.

Office of Public Roads.—The Office of Public Roads was established in 1893. It collects information in regard to systems of road management, furnishes expert advice on road building, makes investigations in regard to methods of road construction, tests road-making materials and materials of construction relating to agriculture, makes investigations in regard to road-making materials in the various states, and prepares publications on these subjects.

Division of Publications.—The Division of Publications originated in 1889 as a section of the Division of Statistics, was organized separately in 1890 as the Division of Records and Editing, and was given its present name in 1895. It exercises general supervision over the Department printing and illustrations, edits all publications of the Department except those of the Weather Bureau, has charge of the Yearbook and farmers' bulletins, distributes department publications, prepares and distributes official information and notices of publications to agricultural writers and papers.

Library.—The Library of the Department was first officially recognized by the appointment of a librarian in 1871. The collection of books had its origin in the transfer, in 1869, of the works on agriculture from the library of the Patent Office. Additions have been made from time to time by exchange and purchase. The library now contains 100,000 volumes, and is undoubtedly the best separate collection on agriculture and allied subjects in the United States,—probably one of the best in the world.

Service of other executive departments of the national government.

Much work having more or less direct relation to agriculture is done in the other executive departments of the national government, and it therefore seems appropriate to include here a brief summary statement regarding the chief agencies for such work.

Department of State.—In the Department of State, the Bureau of Trade Relations prepares instructions to consular officers for reports to be printed by the Department of Commerce and Labor (see Department of Commerce and Labor, Bureau of Manufactures), revises and transmits such reports to said Department and to other branches of the Government Service, and compiles commercial information for the use of the Department of State. Considerable information regarding foreign agriculture and trade relations affecting agricultural business is obtained through the consular service.

Treasury Department.—In the Treasury Department, the Office of the Commissioner of Internal Revenue is charged with the collection of all internal revenue taxes and the enforcement of internal revenue laws. These taxes, amounting in the fiscal year 1907 to about $270,000,000, are levied on manufactured articles directly made from agricultural products, except playing-cards, on which about $570,000 is collected, and bank circulation, which is essentially a prohibitory measure yielding no revenue. The articles yielding the principal revenue are spirits distilled from grains, molasses and fruits, fermented liquors and tobacco. About $800,000 is derived from oleomargarine, and $162,000 from process or renovated butter, together with small amounts from adulterated butter, filled cheese, and mixed flour. Under the Act of Congress passed June 7, 1906, and amended March 2, 1907, the Commissioner of Internal Revenue is charged with making the regulations under which alcohol mixed with methyl alcohol or other denaturing material may be tax free.

Post Office Department.—In the Post Office Department, the Office of the Fourth Assistant Postmaster General deals with all matters relating to the rural delivery of mail. In this office, all petitions for the establishment and extension of rural free-delivery service are received, examined and passed on; orders pertaining to the extension of existing service or installation of new service and to the appointment and discipline of rural letter carriers are here issued, and correspondence relating to the requirements for rural mail-boxes and other matters connected with the supervision and maintenance of the rural free-delivery service is here conducted.

Rural free delivery of mail began in 1897, when there were eighty-three carriers and a total expense of about $15,000. Eleven years later, in 1908, there were 39,339 carriers and an expense of about $35,573,000. The initial step in securing this service is the filing of a petition, which should be signed by heads of families or householders actually residing along the proposed route of delivery. A post-office inspector then visits the locality and, if the conditions are favorable, lays out the route. The roads to be traveled should be in good condition, and the streams to be crossed should be bridged or fordable at all seasons of the year. On every route of twenty-four or more miles in length, there should be a possible patronage of at least one hundred families. Before the free delivery is begun, the postmaster at the distributing office must certify that not less than three-fourths of the possible patrons have provided for mail-boxes conforming to the regulations of the department. The Post Office Department, as well as the Department of Agriculture, is aiding the local road officials in securing better roads as a means of improving the free-delivery service, and is thus contributing in two ways to the improvement of the general conditions of country life.

Department of the Interior.—In the Department of the Interior, the Commissioner of the General Land Office has charge of the survey and sale of public lands of the United States, and performs all executive duties relating to private claims of land and grants of public land, under the Homestead act and other acts of Congress.

The Commissioner of Indian Affairs has charge of the Indian tribes, their lands, moneys, schools, supplies, and general welfare. This branch of the government is doing much to help the Indians living on Government reservations to become efficient farmers.

The Commissioner of Education is charged, among other duties, with the administration of funds appropriated by the federal government for the endowment of colleges for the benefit of agriculture and mechanic arts. Through the Secretary of the Interior, he transmits annually to the Secretary of Agriculture reports on the work and expenditures of these institutions.

The Director of the Geological Survey has charge of the classification of public lands and examination of the geological structure, mineral resources, and products of the national domain, the survey of forest reserves, and the measurement of streams and determination of the water-supply of the United States, including the investigation of underground waters and artesian wells.

The Director of the Reclamation Service has charge of the reclamation of arid lands, including the engineering operations to be conducted by the use of the reclamation fund created by act of June 17, 1902, from the proceeds of sales of public lands. Under this law, he is authorized to devote the funds thus arising from the sale of public lands in Arizona, California, Colorado, Idaho, Kansas, Montana, Nebraska, Nevada, New Mexico, North Dakota, Oklahoma, Oregon, South Dakota, Utah, Washington and Wyoming, to the examination and survey and construction of irrigation works for the storage, diversion and development of waters, including artesian wells, in these states. Under this law, the Reclamation Service has undertaken projects for the reclamation of many million acres, which need only the application of water to make them rank among the richest agricultural lands in this country. The water rights under the reclamation projects are sold to settlers at a price covering the cost of the irrigation work, and are to be paid for in ten annual installments.

Department of Commerce and Labor.—The Bureau of Corporations investigates corporations engaged in interstate industries, and compiles and publishes useful information concerning these corporations. Many of its inquiries concern matters of vital interest to agriculture. Among these are its investigations on the beef trust, the transportation of petroleum, the tobacco industry, cotton exchanges, and manufacturers of harvesting machinery.

Among the functions of the Bureau of Manufactures is that of developing markets at home and abroad for articles manufactured in the United States. Some of the information needed in this work is obtained by special agents of the department, but much is also secured through the Secretary of State from the reports of consular officers and commercial agents. This information is published in the daily and monthly Consular Reports of the Bureau, and includes many items concerning agriculture in foreign countries, markets for agricultural products, and other matters directly and indirectly related to agriculture in this country.

The Bureau of Labor acquires and disseminates useful information on subjects connected with labor in the most general and comprehensive sense of that word It publishes a bi-monthly bulletin containing data concerning the conditions of labor in this and other countries, including occasional special articles on matters relating to agriculture, such as retail prices of food, immigrants who have become farmers, wages, hours of labor and similar matters.

The Bureau of the Census is charged with the duty of taking the periodical censuses of the United States and of collecting such special statistics as are required by Congress, including the collection annually of statistics of the cotton-production of the country as returned by the ginners, and of the consumption of cotton. In connection with each periodical census the Bureau collects, tabulates and publishes detailed information concerning the number, acreage, condition and value of farms, the production and value of farm crops and animals, and other general and special facts concerning agriculture.

One of the important functions of the Bureau of Standards is to test and calibrate standard measuring apparatus of all sorts, and it is coöperating with state and city officials in an effort to awaken an interest throughout the country in the use of correct weights and measures. It is authorized to exercise its functions for officials and private corporations and individuals. For all comparisons, calibrations, tests, or investigations, except those performed for the government of the United States or state governments, a reasonable fee is charged.

The Superintendent of Documents.—In addition to the farmers' bulletins and other publications which are distributed free of charge by the Department of Agriculture and members of Congress, the Government issues many documents of interest and value to persons engaged in agriculture, which are sold by the Superintendent of Documents, Government Printing Office, Washington, D. C. This officer issues price-lists which may be obtained on application.

State service in aid of agriculture.

All the states and territories, except Utah, Arizona and Alaska, have organized agencies through which they officially aid agriculture. In sixteen states, the officials directly in charge are known as commissioners of agriculture; in twenty-five states, as secretaries of departments or boards of agriculture; and in Pennsylvania there is a secretary of agriculture. In Washington and New Mexico, the duties are performed by the secretary of state; in Wyoming, by the state engineer; in Idaho, by the commissioner of immigration. In the Philippine Islands, such work is done by the insular bureau of agriculture; in Porto Rico, by the commissioner of the interior; in Hawaii, by the secretary of the board of agriculture. The chief distinction between the "commissioners" and "secretaries" is that the commissioners are usually either elected by the people or appointed by the governor, while the secretaries are elected or appointed by boards of agriculture.

Some of the principal directions in which agriculture is being assisted through officials acting for the state are the following: Collecting, publishing and distributing crop statistics; holding state and district fairs; conducting farmers' institutes; enforcing laws relating to highways, forests, live-stock, fertilizers, cattle and human foods, dairy products, and the like; the control of insect pests and fungous diseases in orchards, nurseries and vineyards; enforcing quarantine laws against rabies and other animal diseases; conducting test-farms; acting as regents for agricultural colleges; operating bureaus of immigration; preparing and publishing annual reports, agricultural journals and bulletins; distributing seeds and plants.

State agricultural officials hold office one to four years, and usually have their headquarters at the state capitals. Appropriations for these boards or departments vary from a few hundred dollars annually to many thousands. Annual reports of work and expenditures are usually made to the governor, and often printed for distribution. In some of the states, all the activities relating to agriculture are assembled in a single department, and in others are distributed among several organizations having special functions.

The agricultural colleges and experiment stations in the United States are organized as state institutions and receive the largest share of their financial support from the state. The governors and other state officials are, in many cases, ex-officio members of the governing boards of the colleges and stations. These institutions, as a rule, are working in close coöperation with the state governments and are often required by law to aid the state departments in matters relating to the control of foods and fertilizers, the holding of farmers' institutes, the organization of agricultural schools, and like work. It must be said that as yet comparatively little attention has been given in this country to the systematic organization of the state business relating to agriculture with a view to distinguishing between those functions which properly belong to executive departments of state governments and those which are essentially of an educational character. With the growing public interest in agricultural affairs, we may expect that in the future much more attention will be given to the efficient organization of the state work relating to this great industry.

GOVERNMENT SERVICE FOR AGRICULTURE IN CANADA

By *Charles F. Whitley*

Government assistance to agriculture in Canada is given through the Dominion Department of Agriculture at Ottawa, and through the departments in each of the several provinces. The total appropriations each year are upward of three and a half million dollars.

Service of the Dominion Department of Agriculture.

The Dominion government renders invaluable aid through experimental farms, the central at Ottawa, Ontario, and the branch farms at Nappan, Nova Scotia; Brandon, Manitoba; Indian Head, Saskatchewan; Agassiz, British Columbia; and two new farms at Lacombe and Lethbridge, Alberta; making in all 2,900 acres. Negotiations are in progress for other farms, with a view of establishing twenty altogether.

The central experimental farm.—At the central farm, Ottawa, examples are given in improved methods of soil cultivation, and in selection of choice varieties of grain and other crops combining productiveness, earliness, and quality. Much attention is given to the breeding of new varieties of cereals. Large quantities of free samples are distributed annually. Rotation of crops, use of natural and artificial manures, plowing under of clovers, and kindred subjects, are all carefully studied and the results published. Demonstrations are made with horses, dairy and beef cattle, as to the most profitable methods of feeding, and conclusions are given as to economic production of pork and mutton.

In the horticultural division, all kinds of fruits and vegetables are studied, also tobacco, shrubs and timber trees. Insecticides and fungicides are tested in the entomological division, to enable farmers to combat, rationally and economically, losses from insects and plants. The staff of chemists examines soils, well-waters, fertilizers, fodders, and the like, while conducting important research work. Experimental investigation of all kinds is undertaken with regard to poultry.

Branch farms.—At the branch farms, field work is conducted suitable to the various requirements of the several districts.

International exhibitions.—Canada's striking participation in international exhibitions during the past few years has been of marked benefit in attracting an agricultural class of immigrants to the rural districts.

Dairy and cold storage.—The branch of the Dairy and Cold Storage Commissioner has successfully demonstrated, through four stations in Ontario and Quebec, the value of the cool curing of cheese. Plans are available for those interested in the construction of butter and cheese factories. The butter industry is being carefully fostered. Considerable attention is also paid to the improvement of dairy herds through organizing cow-testing associations. An inspector watches against adulterations and improper marking of dairy products. Transportation is arranged for cheese and butter in iced cars on railroads and cold storage on steamships. Bonuses are paid for creamery cold storages. Cargo inspectors are employed in watching the loading and stowage of cheese, butter, eggs, bacon, fruit and poultry for export. Inspectors note the packing and grading of fruit, thereby enforcing the Fruit Marks Act; they also hold orchard meetings, and give demonstrations in spraying, pruning, packing and similar subjects.

Recent legislation includes an act to encourage the establishment of cold-storage warehouses for the preservation of perishable food products, whereby a subsidy not exceeding 30 per cent of the cost is payable in five yearly installments.

Seeds.—The Seed Commissioner's branch has for its object the increased yield and improved quality of crops through the use of better seed. Interest is stimulated among farmers in the growing and selecting of seeds of superior quality. Such means are adopted as may be expected to secure the distribution among farmers of the best seed produced in any district, and restrictions are put on the sale for seeding of seeds that are foul with noxious impurities. Seed fairs are assisted, and in the laboratories at Ottawa and Calgary thousands of samples are tested for purity and vitality. A special seed train recently made a tour of two months through the Canadian Northwest, with a corps of experts who delivered addresses and exhibited specimens of grains and weeds to the thousands who gathered in and about the cars at stopping places.

Live-stock.—In 1900, Dominion legislation provided for the incorporation of Live-stock Record Associations, not more than one for every distinct breed of horses, cattle, sheep and swine.

The work under the Veterinary Director-General and Live-stock Commissioner is directed toward the improvement of the stock-raising industry in Canada. This work is conducted through the agencies of expert teachers and stock judges; carloads of stock for demonstration are yearly taken through several districts. The systematic distribution of pure-breds by means of coöperative auction sales, the yearly testing of pure-bred dairy herds, the supervision of the accuracy of registration of pure-bred animals, and the extension of the nationalization of live-stock records, are additional means of accomplishing the work. Special oversight is given to the export cattle trade.

The value of effective machinery for the control and, where possible, the eradication of contagious animal diseases cannot be overestimated in view of the rapidly increasing importance of the live-stock interests. Reliable information as to the nature of outbreaks of disease is disseminated by the work of the biological laboratory at Ottawa. Inspectors and quarantine buildings at many places afford facilities for the examination of stock. There is rigid inspection of all meat and canned-food establishments by a specially trained staff.

Addresses and reports.—Officials of all the Dominion departments at Ottawa are in constant request to address farmers' meetings in the provinces. Annual reports and frequent special bulletins are distributed gratis by all branches of the service. The total expenditure by the Dominion Department of Agriculture on the foregoing amounts to $1,500,000 annually.

Provincial service in aid of agriculture.

Ontario. — The Ontario government disbursed $750,000 in 1908 in assistance to agriculture. The college at Guelph, now in its thirty-fourth year and excellently equipped in all departments, offers courses of all kinds extending to four years, with the degree of B.S.A. At present, over seven hundred students are enrolled. The Ontario Veterinary college is now conducted as a branch of this department. There are also 344 students in the spacious buildings of the adjoining Macdonald Institute and Macdonald Hall, intended especially for farmers' daughters who attend lectures in the college.

Extensive field experiments are conducted on the 450-acre college farm, and a separate fruit-experiment farm has recently been established. Assistance is given to agricultural societies; a most comprehensive series of meetings is arranged for in connection with farmers' and women's institutes; while fruit-growers', vegetable-growers', entomological, beekeepers', and poultry associations are encouraged. The dairy and live-stock interests are substantially remembered, a special horse-breeding inquiry being now in progress, while over thirty instructors and sanitary inspectors visit cheese-factories and creameries. There are dairy schools at Guelph and Kingston. A bounty is paid on beet-sugar, and the important and far-reaching work of 6,000 members of the experimental union is helped. The colonization of "New Ontario" is being rapidly effected. The Bureau of Industries, at Toronto, compiles agricultural statistics.

Quebec.—The Department of Agriculture for the province of Quebec will spend $278,000 in 1908. Its grants to farmers' clubs and agricultural societies will amount to half this expenditure. Two agricultural schools are maintained at Oka and Ste. Anne de la Pocatière, as well as the Laval Veterinary School, at Montreal. Two domestic science schools, at Roberval and St. Paschal, intended primarily for farmers' daughters, are also assisted. The institution at the former point, established in 1881, was probably the first of the kind on the continent of North America. The dairy school at St. Hyacinthe, recently rebuilt on a considerably larger scale at a cost of over $70,000, is well equipped, and the dairy industry is assiduously fostered by grants to factory syndicates and sixty-four inspectors. The provincial laboratory is established in connection with the school.

Assistance is given to horticultural, pomological and poultry associations, also to local fairs. Agricultural-merit competitions are held, and help given to the improvement of rural roads. The Journal of Agriculture, which is published in both French and English, is issued regularly every month. It has a large circulation.

New Brunswick.—The province of New Brunswick expends a little over $39,000 in grants to agricultural societies, to butter and cheese factories, to the dairy school at Sussex, and in encouraging dairying, farmers' institutes, stock-breeders' associations, in maintaining twenty illustration orchards, cold-storage plants and roller mills, in helping exhibitions, and in assisting students attending agricultural colleges. In addition to this, an act is to be introduced providing for the expenditure of $25,000 to import Clyde and Percheron mares to be sold in the province for breeding purposes.

Nova Scotia.—The province of Nova Scotia assists 166 agricultural societies owning pure-bred rams, boars, bulls and stallions, by aiding in the purchase of sires for disposal by auction. Two traveling dairies penetrate from one extremity of the province to the other; the local markets are so good and so easily available that the larger proportion of the butter is made in private dairies. Twenty-eight model orchards have been set out in this famous fruit province, and several more are in prospect. For four years the department has sent exhibits of fruit to England, where it has been awarded many gold medals. Provision is made for assisting fat-stock shows and county exhibitions. The recently established agricultural college and farm at Truro is doing excellent work. The total appropriation is $66,000.

Prince Edward Island.—The province of Prince Edward Island spends $5,600 in assistance to fruit-growers' associations, dairy associations, farmers' institutes, good-seed meetings, and experimental work at the provincial farm. Competitions in judging beef and dairy cattle at the Charlottetown exhibition are also inaugurated.

Manitoba.—The province of Manitoba is providing upward of $280,000, and has recently built an agricultural college at Winnipeg. In the interests of dairying, there is a superintendent of creameries and one of cheese factories, while the grain-growers have a noxious-weeds inspector. The dairy association is assisted, also the live-stock association, which embraces cattle, horses, sheep and swine. Registration is provided for cattle brands. Through the horticultural society, a large distribution is made of trees, shrubs, fruits and climbers.

Saskatchewan.—The province of Saskatchewan pays grants to fifty-one agricultural societies, based on membership, prize money offered, experiments conducted, and similar work. These societies are assisted in the maintenance of up-to-date agricultural libraries. Official judges are furnished for forty fairs. Liberal assistance is given to the grain-growing industry, and provision made for weed inspection and the destruction of noxious animals, such as wolves and gophers. The stock-breeders' association is assisted in horse-shows and pure-bred cattle sales, and with the province of Alberta a joint brand office is maintained. Much traveling dairy work is done, especially in districts largely settled by foreigners. Loans are made to creameries and cash advanced to patrons for butter, eggs and poultry, the department being recouped from sales thereof. A bacteriological laboratory is established, and scholarships are offered for one or another of the agricultural colleges. The total estimated expenditure for 1908 is over $179,000.

Alberta.—The province of Alberta votes over $470,000 toward agriculture, one-half of which, however, is in the nature of advance payments to patrons of forty-two creameries, the department being reimbursed from the sales of butter. Somewhat similar methods are in operation as regards poultry. The sugar-beet industry is liberally helped, and the general work of live-stock and agricultural associations promoted. Provision is made for destruction of wolves and coyotes, also of noxious weeds.

Decided success attends the establishment of stock-judging schools, two carloads of animals being used for illustration. A travelling dairy is sent among the settlement of foreigners. Valuable work is done by inspectors of live-stock shipped by rail in supervising brands. Seven fruit experiment stations are in operation, with more contemplated. An effort is made to extend the markets available to farmers, the trade in oats and meats being well looked after. The seed fair is a decided success. A bacteriological laboratory is to be established this year.

British Columbia.—The province of British Columbia appropriates upward of thirty thousand dollars toward the maintenance of agricultural, fruit-growers', dairymen's and flockmasters' associations. Horticulture, including orchard inspection and poultry-raising, receives grants, and a thorough series of farmers' institute meetings embraces every agricultural district.

Macdonald assistance.—It must be added that agriculture in Canada owes an immense debt to Sir William Macdonald, who is spending upward of two million dollars on the new college buildings and 500-acre farm at Ste. Anne de Bellevue, near Montreal, Quebec, with an additional equal sum as an endowment. To his liberality are due also the buildings bearing his name at Guelph, Ont., and the inception of consolidated rural schools with illustration plots in many provinces.

Assistance from other federal departments.

Geological Survey.—Not only has the Geological Survey been of great service to Canada in giving to the civilized world a knowledge of the topography, geology and mineral resources of the country, but in an equal degree it has promoted the building of roads and railways, the extension of agriculture, and the settlement of the country.

The Department of the Interior deals with the survey and administration of public lands largely in Manitoba and the provinces of Saskatchewan and Alberta. It opens up vast areas of excellent arable land practically free of cost to settlers, leases grazing lands for ranches, and takes precautions against prairie fires. Through the Immigration branch, it advertises in foreign lands the vast wealth of Canadian agricultural resources. The department looks particularly for good farm laborers. Through the Topographical Surveys branch, surveys are made for townships for settlement, and full descriptions of land, timber and water are published.

The Department of Indian Affairs specifically encourages Indians to invest proceeds of individual industry in property. One-third of the able-bodied working Indians in Canada are engaged in mixed farming, cultivating over two hundred thousand acres. The Department provides teachers for over three hundred schools.

The Department of Railways and Canals maintains and operates two government railroads, the Intercolonial and the Prince Edward Island. Both show large increases in the handling of such freight as flour, meal, live-stock, and similar articles. Under the supervision of four commissioners, the eastern division of the new trans-continental railroad from New Brunswick to British Columbia is being constructed. This Department pays subsidies to various companies chartered in districts that are principally agricultural. The control of an extensive canal system, on which the carrying of agricultural products is steadily growing, comes under the scope of this Department.

The Department of Public Works supervises the improvement of harbors, rivers, roads and bridges largely used by the farming population. It sees to the construction and maintenance of the several public buildings, such as postoffices, immigrant sheds, experimental farms, and cattle-quarantine buildings. It maintains upward of six thousand miles of a telegraph system in rural districts.

The Department of Trade and Commerce compiles full statistics of all imports and exports, including animals and their products, fertilizers, seeds, agricultural machinery, and numerous other articles.

It provides for the inspection of such staple products as wheat, hay, leather, and the like, and establishes commercial agencies in foreign countries to extend trade. It issues weekly bulletins containing trade inquiries, and reports of trade commissioners and commercial agents.

QUARANTINE LAWS AND PRACTICES

By *A. M. Farrington*

The experience and observation of foreign governments has proved that animal plagues, such as rinderpest, pleuro-pneumonia, and foot-and-mouth disease, are spread by the importation of infected cattle and by contact with infection. The extensive prevalence of rinderpest in Great Britain, and the fact that American stock-owners were buying pure-bred cattle in that country, gave rise to laws for the protection of the cattle industry of the United States.

History of quarantine legislation.

The first federal legislation on this subject, entitled "An Act to prevent the spread of foreign diseases among the cattle of the United States," was approved and passed by the first session of the Thirty-ninth Congress, December 18, 1865, the principal provision specified by this action on the part of Congress being "that the importation of cattle be, and hereby is, prohibited."

The same Congress amended this act under date of March 6, 1866, inserting, among other provisions, that neat cattle and the hides of neat cattle be prohibited importation into the United States. The Secretary of the Treasury was given the duty to make such regulations as were necessary to put the law into full and immediate effect.

This law remained effective until 1874, when it was enacted as part of the Revised Statutes, sections 2493, 2494, and 2495. The first prohibition under these sections was issued July 31, 1875, by the Secretary of the Treasury, prohibiting the importation of neat cattle and the hides of neat cattle from Spain because of the reported prevalence of foot-and-mouth disease. This order was withdrawn in October of the same year; but on November 3, 1875, a similar order was made prohibiting the importation of neat cattle and the hides of neat cattle from Great Britain and Ireland, because of the prevalence of foot-and-mouth disease. This order remained in effect until March 16, 1876, when the Secretary of the Treasury allowed the importation of "blooded stock" from Great Britain and Ireland when accompanied by a certificate from the United States consular officer to the effect that such animals were, at the date of exportation, in a sound and healthy condition and free from foot-and-mouth disease or any indication thereof. On February 26, 1879, when the Treasury department learned that contagious pleuro-pneumonia existed in England, the ports along the Atlantic seaboard were closed to English cattle until otherwise ordered. This prohibition against England was revoked July 1, 1879, and suspended as to European ports, provided all cattle are kept in quarantine not less than ninety days under the supervision of customs officers at the expense of the parties interested.

The discovery that contagious pleuro-pneumonia existed among American cattle, and the order issued by the Privy Council of Great Britain in 1878 requiring the slaughter of all American cattle at the port of landing, led to the appointment of the Treasury Cattle Commission, consisting of Prof. James Law, Mr. J. H. Sanders, and Dr. E. F. Thayer. This commission expended, under supervision of the Secretary of the Treasury, a sum of money appropriated by act of March 3, 1883, to establish quarantine stations for the detention of imported cattle. The Secretary of the Treasury, July 30, 1883, issued an order requiring that all neat cattle from any part of the world except North and South America be subjected to a quarantine of ninety days at the port of entry.

Stations for the accommodation of cattle so imported were provided at the ports of Portland, Me., Boston, Mass., New York, N. Y., and Baltimore, Md. By a provision of the Sundry Civil Bill approved July 7, 1884, it was ordered that the money appropriated for establishing and maintaining quarantine stations for neat cattle should be expended by the Commissioner of Agriculture, under supervision of the Secretary of the Treasury. The Commissioner of Agriculture, August 25, 1884, issued an order specifying that all neat cattle arriving in the United States from any part of the world except North and South America be landed only at such ports on the Atlantic seaboard as are provided with cattle quarantine accommodations under control of officers of the Department of Agriculture; further, that persons contemplating the importation of cattle must obtain permits.

It will be observed that the above law and regulations applied simply to one class of livestock, namely "neat cattle." Since the infection of several contagious diseases—notably rinderpest and foot-and-mouth disease—can be imported by sheep or swine, an act was passed and approved August 30, 1890, which provided (Section 6) "That the importation of neat cattle, sheep, and other ruminants, and swine that are diseased or infected with any disease, or which shall have been exposed to such infection within sixty days next before their exportation, is hereby prohibited."

The administration of this act was intrusted to the Secretary of Agriculture who was authorized (Section 7) "to retain in quarantine all neat cattle, sheep, and other ruminants, and all swine imported into the United States, at such ports as he may designate for such purpose." The regulations now in force for the inspection and quarantine of neat cattle, sheep, other ruminants, and swine, imported into the United States, are drawn under authority of this act. The Department of Agriculture maintains animal quarantine stations at the ports of Boston, New York and Baltimore. The most complete station is located at the port of New York, where the largest number of animals are imported. Inspection and quarantine stations are maintained along the boundary line between the United States and Mexico, and also along the boundary line between the United States and Canada.

The regulations apply to wild ruminant animals imported for exhibition or zoölogical gardens, as well as to domesticated ruminant animals. The period of quarantine for cattle from any part of the world except North America, Great Britain, Ireland, and the Channel Islands, is ninety days; sheep and other ruminants and swine fifteen days. For cattle from Great Britain, Ireland, and the Channel Islands, the quarantine period is sixty days.

Authority to prevent the introduction of contagious diseases was strengthened by an act approved February 2, 1903, entitled "An Act to enable the Secretary of Agriculture to more effectually suppress and prevent the spread of contagious and infectious diseases of live-stock, and for other purposes."

The existence of a serious contagious disease (contagious pleuro-pneumonia) among cattle in the United States caused the Congress of the United States to create in the Department of Agriculture a Bureau of Animal Industry, charged with the duty of inquiring into the causes of contagious, infectious, and communicable diseases, and, in coöperation with state authorities, to adopt means for the suppression and extirpation of such diseases. This act was approved on the 29th day of May, 1884.

Pleuro-pneumonia.—After suitable investigation, rules and regulations for coöperation between the United States Department of Agriculture and the authorities of the states and territories for the suppression and extirpation of contagious pleuro-pneumonia were issued, under date of July 1, 1885. Infected or exposed cattle, when discovered, were placed in quarantine under state laws, and the shipment of diseased and exposed cattle from one state to another was prohibited.

Work for the eradication of this disease was vigorously prosecuted, in coöperation with the states in which the lung plague existed, until the last case was destroyed. On September 26, 1892, the Secretary of Agriculture, the late J. M. Rusk, officially declared by proclamation "That the United States is free from the disease known as contagious pleuro-pneumonia." This was a notable achievement.

Texas fever.—By the same act the interstate transportation of any live-stock affected with any contagious, infectious, or communicable disease was forbidden; an exception being made in the case of splenetic or Texas fever "as to cattle being transported by rail to market for slaughter, when the same are unloaded only to be fed and watered in lots on the way thereto."

The first regulation under this act relating to Texas fever was promulgated July 3, 1889. It prohibited the shipment of cattle except under certain conditions from a small area in the South. Two years later the area placed under quarantine for Texas fever was extended and included practically all of the southern states.

Scabies of sheep.—The next communicable disease to receive attention from the federal government was scabies of sheep, or sheep scab. Regulations regarding this disease were issued June 18, 1897. For the purpose of further preventing the spread of sheep scab, it was ordered that after August 10, 1899, no sheep affected with scabies and no sheep that have been in contact with others so affected shall be allowed interstate shipment unless dipped in a mixture approved by the Department of Agriculture. The dips recognized as effective were the lime-and-sulphur dip and the tobacco-and-sulphur dip.

Considerable progress was made under this regulation in suppressing the disease; but, in consequence of the serious outbreak of foot-and-mouth disease that occurred in the New England states in the fall of 1902, it was deemed necessary that additional power should be conferred on the Secretary of Agriculture to enable him to cope properly with contagious diseases affecting the live-stock of the United States, and to prevent the introducion of such diseases from foreign countries.

Accordingly, an act of Congress was approved February 2, 1903, entitled, "An Act to enable the Secretary of Agriculture to more effectually suppress and prevent the spread of contagious diseases." Early in March, 1903, regulations were issued under this act relating to Texas fever, sheep scab, hog cholera and swine plague, and cattle scab.

Power of the federal government.

In all the legislation previously referred to, the federal officers have not been given authority to quarantine any state or section of a state in which a contagious, infectious, or communicable disease of animals existed. Their power was limited to the interstate shipment of diseased animals or those that had been exposed to disease. This condition of affairs led to the passage of the act that is now in force, approved March 3, 1905, and entitled, "An Act to enable the Secretary of Agriculture to establish and maintain quarantine districts, to permit and regulate the movement of cattle and other live-stock therefrom, and for other purposes." It provides (Section 1):

"That the Secretary of Agriculture is authorized and directed to quarantine any State or Territory or the District of Columbia, or any portion of any State or Territory or the District of Columbia, when he shall determine the fact that cattle or other live-stock in such State or Territory or District of Columbia are affected with any contagious, infectious, or communicable disease; and the Secretary of Agriculture is directed to give written or printed notice of the establishment of quarantine to the proper officers of railroad, steamboat, or other transportation companies doing business in or through any quarantined State or Territory or the District of Columbia, and to publish in such newspapers in the quarantined State or Territory or the District of Columbia, as the Secretary of Agriculture may select, notice of the establishment of quarantine."

Regulations now in force.

Regulations of May 1, 1905, were issued under this act to prevent the spread of splenetic or Texas fever of cattle, scabies in cattle, scabies in sheep, and of hog cholera and swine plague. These regulations were afterward revoked and superseded by the regulations promulgated March 22, 1907, and made effective April 15, 1907, which are those now operative.

By a rule issued by the Secretary of Agriculture, "all the territory situate within the boundaries of California, Oklahoma, Indian Territory, Texas, Arkansas, Louisiana, Mississippi, Alabama, Tennessee, Virginia, North Carolina, South Carolina, Georgia, and Florida," has been placed in quarantine, because of the existence among cattle of the contagious and infectious disease known as splenetic, southern or Texas fever. It is ordered that the interstate movement of cattle of the quarantined area shall be made only in accordance with the above regulations subject to the following exceptions, to wit, that the states of California, Texas, Tennessee, Georgia, North Carolina, Virginia, and Territory of Oklahoma, having fixed quarantine areas within their respective boundaries which differ from the quarantine fixed by the Secretary of Agriculture, and having enacted quarantine laws necessary to enforce the quarantine of such areas, the said state and territorial quarantined areas that are definitely described are adopted by the Secretary of Agriculture.

The areas comprise, roughly speaking, a few counties in the southern part of California, nearly all of the state of Texas excepting the Panhandle, the eastern half of Oklahoma, all of Arkansas except a few northern counties, all of Louisiana, Mississippi, Alabama, South Carolina, and Florida, a few counties in the southern part of Tennessee, all of Georgia excepting three counties in the northern part, eastern North Carolina, and a few counties in the southern part of Virginia.

In general, the regulations prohibit the interstate shipment of cattle from the quarantined area except for immediate slaughter in cars placarded "southern cattle," and, when unloaded en route for feed and water or at destination, the unloading shall be in special separate pens or yards, known as "quarantine pens." During the months of January, November, and December, cattle from the quarantined area may be shipped to certain northern states, subject to such restrictions as may be imposed by the officials of such states.

Quarantined areas.

The quarantined area and the regulations are modified from time to time as may be necessary, and interested parties may apply to the Secretary of Agriculture at Washington, D. C., for a copy of such regulations when definite information is desired. Cattle from the quarantined area that have been dipped in Beaumont crude petroleum or other mixture approved by the Secretary of Agriculture under supervision of an inspector of the Bureau of Animal Industry, may be shipped without restrictions except those imposed by state officials at destination, when certified by an inspector of the Bureau of Animal Industry as free from ticks.

The area quarantined because of the existence of cattle mange, or scabies, consists of four northern counties of Montana, the parts of North Dakota and South Dakota west of the Missouri river, five southeastern counties of Wyoming, the western half of Nebraska and Kansas, the eastern half of Colorado, eight counties in eastern New Mexico, and the Panhandle of Texas and Oklahoma.

Cattle that are diseased with scabies shall not be shipped or moved to another state or territory or the District of Columbia unless examined and accompanied by a certificate from an inspector of the Bureau of Animal Industry; but cattle affected with scabies may be shipped interstate, after being dipped in mixtures approved by the Department of Agriculture.

The area quarantined for sheep scab, or scabies, consists of the States of Washington, Oregon, Montana, western North Dakota, South Dakota, California, Nevada, Utah, Colorado, Texas, Arizona, and New Mexico. The states of Wyoming, Nebraska, Kansas, and Idaho were formerly in the quarantined area; but, through the energetic efforts of the Department of Agriculture and the state authorities, they have been released as free from scab.

No sheep that are diseased with scabies are allowed to be shipped or otherwise removed from one state or territory to another state or territory until such sheep have been examined by an inspector of the Bureau of Animal Industry and found free of scab or exposure to the same, and are accompanied by a certificate from such inspector. Diseased sheep may be dipped to cure them of scab in dips approved by the Department of Agriculture. Sheep visibly diseased with scab must be dipped twice after an interval of ten days before they can be moved as healthy sheep. Sheep exposed to the disease either through yards, pens, cars, or similar places, require but one dipping.

No area has been quarantined because of hog cholera and swine plague, but no swine that are affected with these diseases or have been exposed to the contagion, either from contact with diseased animals or by confinement in infected cars, pens, or other premises, shall be moved from one state into another, except that exposed swine may be shipped to a recognized slaughtering center for immediate slaughter.

General purpose of quarantine legislation.

The evident design of legislation for the protection of the live-stock of the United States is that the general government shall guard against the importation of dangerous diseases from foreign countries, also that this same general authority shall take such measures as shall be necessary to prevent the spread of disease from one state to another, in regulating and supervising by its paid and duly accredited officers the interstate shipment of animals.

One means of accomplishing this object is to require the cleaning and disinfection of cars that have been used in transporting animals affected with contagious diseases, as well as the stock-yards and pens where such animals have been held. This work at the present time is supervised by agents of the Department of Agriculture, and should be extended to make results more effective and complete.

Canadian quarantine laws and practices.

The Canadian government, for a number of years, has maintained a quarantine for cattle imported from Great Britain and other European countries. The principal station for the detention of imported cattle is located at Quebec on premises formerly occupied as a fort, where incoming steamers can unload their animals direct from the steamer on the grounds of the station.

A veterinary service has been organized in connection with the Department of Agriculture of Canada, with an officer known as Veterinary Director-General, in charge of the Health of Animals branch of the department, with headquarters at Ottawa.

A person contemplating the importation of animals other than horses from any part of the world, excepting the United States and Newfoundland, must first get a permit from the Minister of Agriculture stating the number and kind of animals to be imported, the country of origin, and other similar information.

The ports at which animals are permitted to land are Victoria, Vancouver, Quebec, Halifax, St. John, N. B., and Charlottetown, P. E. I. The period of quarantine is sixty days for cattle from the United Kingdom, and ninety days for cattle from all other countries except the United States, Newfoundland, and Mexico. Against sheep, goats, and swine a quarantine of thirty days is enforced, and each shipment must be accompanied by health certificates. Horses, mules, and asses imported from countries other than the United States, Newfoundland, and Mexico, are admitted on inspection, if proper health certificates are furnished. When importing animals from the United States and Newfoundland, the owner or importer must file a declaration or affidavit stating the purpose for which the animals are imported, whether for breeding purposes, milk-production, grazing, or whatsoever, which document must be presented to the Collector of Customs at the port of entry. On and after March 1, 1907, the importation of branded or western range horses, other than those which are broken to harness or saddle, is prohibited.

Horses, mules, and asses must be inspected at the port of entry, and accompanied by a certificate of mallein test made within thirty days, signed or endorsed by an inspector of the United States Bureau of Animal Industry, or signed by an inspector of the Canadian Department of Agriculture.

Range cattle entering Canada from the United States, unless accompanied with proper health certificates, are detained at the boundary, and dipped or otherwise treated to rid them of mange, at the expense of twenty-five cents per head, payable by the owner or importer. Cattle for breeding purposes and milk-production, if unaccompanied by a satisfactory tuberculin test chart, are detained in quarantine for one week and subjected to the tuberculin test. Cattle reacting to the test are returned to the United States, or slaughtered without compensation.

Sheep and goats are inspected on entry, and if diseased are dealt with as the Veterinary Director-General may direct.

All swine must be accompanied by a certificate, signed by a veterinarian of the United States Bureau of Animal Industry, stating that neither swine plague nor hog cholera has existed within a radius of five miles of the premises in which they have been kept for a period of six months immediately preceding the date of shipment; but such swine must be inspected, and shall be subjected to a quarantine of thirty days before being allowed to come in contact with Canadian animals.

All stock-cars used in connection with shipments of live-stock into or from Canada must be thoroughly cleansed and disinfected before animals are placed therein.

All hogs entering Canada for transit, and all cars conveying such hogs, must be inspected. These inspections must be made in daylight between the hours of 8 A. M. and 4 P. M., unless satisfactory artificial lighting is provided. Other precautions, such as douching hogs with water, unloading while in transit, and the use of ten-inch boards around the bottom of the car to prevent the dropping of the litter and manure in transit, are taken to prevent the contagion of hog cholera or swine plague from being imported into Canada from the United States.

The authority for such regulations, together with authority for the control of contagious and infectious diseases of animals in Canada, is contained in the Animal Contagious Diseases Act, 1903.

LEGISLATION RELATING TO BOVINE TUBERCULOSIS

By *Veranus A. Moore*

The laws pertaining to bovine tuberculosis are numerous and varied. As early as 1370, it was forbidden in Munich to have on sale the flesh of animals affected with tuberculosis. Other European cities passed similar ordinances. In 1783, the Berlin Board of Health declared the flesh of tuberculous animals to be fit for human food. This led, finally, to the canceling of all laws, throughout Prussia, against the use of the flesh for food of animals slightly affected with tuberculosis.

Legislation relating to bovine tuberculosis in the United States was very meager until after the use of tuberculin as a diagnostic agent and the discovery of the prevalence of tuberculosis in the dairy cattle of the country. With the recognition of the extent of the disease, and the belief, then generally entertained, that bovine and human tuberculosis were identical, there was widespread and radical legislation concerning it, based on its sanitary significance. In 1892, the Massachusetts legislature passed a law requiring cities and towns to appoint inspectors of animals. An act was also passed more effectively to prevent the spread of tuberculosis. Later, Massachusetts undertook a compulsory tuberculin test of the cattle of the state, and the slaughter of the infected animals with compensation to the owners. This method of eliminating tuberculous cattle was not generally approved, and the law was soon changed. The state of New York made an appropriation of $50,000 for the testing and destroying of tuberculous cattle, but the sum was found to be too small, and the method did not meet with general approval and, later, it was changed. A number of states have passed laws for controlling bovine tuberculosis, but they have changed frequently and are still undergoing modifications. The ends generally sought for by state legislation are, (1) to protect the state from the entrance of tuberculous cattle from without into the dairy herds; (2) to secure for the cattle owners a reasonable compensation for the slaughtered cattle; and (3) to prevent the interchange of tuberculous-infected animals. The states which have been the most progressive in legislation against tuberculosis are Massachusetts, Wisconsin, Pennsylvania, Minnesota and New York.

The United States government forbids the shipping of cattle known to be tuberculous from one state to another. It does not require the tuberculin test, but animals that have been given a tuberculin test and react are rejected from interstate trade.

Review of certain state and other legislation.

Massachusetts.—In the Commonwealth of Massachusetts, the control of tuberculosis and other infectious diseases of animals since 1902 has been vested in a Cattle Bureau of the State Board of Agriculture. The governor appoints the chief of the Cattle Bureau, who is its executive head. This Cattle Bureau works in conjunction with the local boards of health. The inspectors appointed by the boards of health, with the approval of the chief of the Cattle Bureau, are not veterinarians, but the agents of the Cattle Bureau are. The use of tuberculin is restricted to cattle coming into the state and cattle brought to Brighton, Watertown and Somerville, and cases where the owner requests its application under the provisions of the state law. The law is not entirely satisfactory, but it is thought by the chief of the Cattle Bureau that it tends to diminish the amount of tuberculosis in the cattle of the state. Theoretically, it should be effective by placing the responsibility of first examining the cattle on local inspectors. These, however, are laymen, and not properly qualified to make a diagnosis. The failure to examine the herds sufficiently often or thoroughly to detect the presence of tuberculosis, if it were possible, as soon as an animal becomes suspicious, may permit the disease to spread from the undetected cases. The general practice is not to use tuberculin in the dairies from which tuberculous animals are taken, and, consequently, many infected individuals may develop the disease sufficiently to spread it to others before they are detected and removed by the local inspectors and condemned by the agents of the Cattle Bureau.

Two essential and very valuable features of the law are those which protect the dairymen in the purchase of cows. These are, first, the testing of all cattle that come into the state and the exclusion of all those that react to tuberculin; second, the testing with tuberculin of all dairy cattle that are brought to Brighton, Watertown and Somerville. As Brighton is the chief center for buying and selling dairy cattle, the testing, if carefully made, protects the dairymen who are buying cows from purchasing tuberculous ones.

In Wisconsin, the control of bovine tuberculosis is in the hands of a Live Stock Sanitary Board. This board consists of three members of the State Board of Agriculture, elected by that body, the bacteriologist of the State University, and the State Veterinarian, who is appointed by the governor. The most significant feature of the work is the coöperation with the State Agricultural College, which is waging an active educational campaign for the eradication of bovine tuberculosis. Certain students in the Agricultural College are instructed in the use of tuberculin, as well as in the nature of tuberculosis, and they are advised to test the cattle on their home farms and those of their neighbors who wish to have the test applied to their cattle. The result of this is that large numbers of herds are tested in which the presence of tuberculosis is not suspected. In accomplishing the work, the cattle owners apply to the Agricultural College for tuberculin, which is furnished them, together with blanks for recording the test, on the filling out and signing of a written agreement.

The effect of the work in Wisconsin is, (1) to protect the dairy herds of the state from the introduction of tuberculosis in cattle imported into the state, and (2) an awakening of the dairymen to the importance of having their herds free from this disease. A very important provision of the law is for the economic disposition of the reacting animals. The owner is given the privilege of isolating the animals and using them for breeding purposes, if he wishes. If they are paid for under the statute, they become the property of the Live Stock Sanitary Board. Whenever practicable, they are shipped to one of the packing houses having federal inspection and slaughtered. If they pass the inspection they are paid for. The results of the coöperation with the cattle-owners in applying the test seem to be satisfactory. It must be remembered, however, that these men have been carefully trained at the Agricultural College in the use of tuberculin before they are allowed to apply it. The conclusion should not be drawn that owners of cattle untrained in the use of tuberculin should administer it. There can, undoubtedly, be much assistance rendered by the cattle owners in coöperation with their local veterinarians, but the subject is one that belongs to the trained veterinarian.

Pennsylvania.—In the Commonwealth of Pennsylvania bovine tuberculosis is under the control of the State Live Stock Sanitary Board, one member of which is the State Veterinarian. This board is authorized to take such measures as may be necessary to suppress or eradicate dangerous, contagious or infectious diseases. Under the authority of the law, the Live Stock Sanitary Board has developed an effective method of procedure, known as The Pennsylvania Plan. The plan is based on the belief that the farmers of the state want healthy herds, and are willing to coöperate with the state to that end, provided the terms of coöperation are not more onerous than the disease itself. The essential points in the plan are as follows:

Upon application from owners of tuberculous cattle, the State Live Stock Sanitary Board will furnish tuberculin and inspection free, on condition that the cattle owner will agree to:

(1) Assist in the examination.

(2) Separate the cattle found to be tuberculous from those that are healthy, and have them cared for separately until disposed of, as directed by the State Live Stock Sanitary Board.

(3) Disinfect the stables and correct faulty sanitary conditions, as directed by the State Live Stock Sanitary Board.

(4) Discontinue the use of milk and cream from infected cows, except when boiled or heated to 185° Fahr. and kept at that temperature for five minutes.

In New York, the law relative to the control of tuberculosis has been changed frequently. At present it is incorporated in Article 4, entitled "Diseases of Domestic Animals," of the Agricultural Law, chapter 338, Laws of 1893, amended to July 1, 1908. In this law, tuberculosis is dealt with as other infectious diseases. The law, however, is directed toward the elimination of tuberculosis from the herds of the state, and at the same time to assist the cattle-owners in every possible way by allowing them to keep the reacting animals for breeding purposes; to sell them for beef under proper inspection; and if taken by the state, suitable compensation is allowed. It further prohibits the sale of diseased animals except for immediate slaughter, excepting by contract in which the disease is specified. Article 63 of the law is quoted:

"Care of diseased animals; Experiments.—If, after examination, an animal is, in the judgment of the person making the examination, suffering from tuberculosis, such animal shall be slaughtered under the provisions of this article, or, if the commissioner deems that a due regard for the public health warrants it, he may enter into a written agreement with the owner, subject to such conditions as the commissioner of agriculture may prescribe, for the separation and quarantine of such diseased animal or animals. Subject to the regulations of the department of agriculture, such diseased animal or animals may continue to be used for breeding purposes and its or their milk, after pasteurization at one hundred and eighty-five degrees Fahrenheit, may be used for the manufacture of butter or cheese for sale. The young of any such diseased animal or animals shall, immediately after birth, be separated from their mothers, but may be fed the milk drawn from such affected animal or animals so separated and quarantined after such milk has been pasteurized as herein provided. The owner of a herd of cattle, within the state, may apply to the commissioner of agriculture for examination of his herd by the tuberculin test; said application to be in writing upon a blank form provided by the commissioner of agriculture and to include an agreement on the part of the owner or owners of the herds to improve faulty sanitary conditions; to disinfect his premises, should diseased cattle be found, and to follow instructions of the commissioner of agriculture designed to prevent the reinfection of the herd and to suppress the disease or prevent the spread thereof. The commissioner of agriculture shall, as soon as practicable, cause such cattle to be examined accordingly, subject to the provisions of the agricultural law. When the commissioner deems that the conditions warrant it he may make and issue to such owner a certificate that upon such examination such herd was found free from tuberculosis or that the owner has complied with the provisions of this section by causing all affected animals to be separated from the herd and quarantined as provided herein subject to the regulations of the department of agriculture. The commissioner of agriculture may determine the place of slaughter of an animal to be killed under the provisions of the agricultural law. The commissioner may experiment or cause such experiments to be made or performed as he may deem necessary to ascertain or determine the best methods or means for the control, suppression or eradication of communicable or infectious disease or diseases affecting domestic animals. "No person shall sell any animal known to have a communicable or infectious disease except for immediate slaughter unless such sale be made under a written contract signed by both parties specifying the disease with which such animal is infected, a copy of which shall be filed in the office of the commissioner of agriculture. No person shall knowingly inject into any bovine animal as and for tuberculin any substance which is not tuberculin." (As added by Chapter 518, of the Laws of 1908, passed June 12, 1908.)

In Denmark, where the most successful work in the control of bovine tuberculosis has been accomplished, the appended law is in operation:

Act of February 5, 1904, containing Measures against Tuberculosis among Cattle and Pigs.

A sum of 100,000 Kr., granted every year by the Rigsdag (Parliament) on the recommendation of the Committee of Ways and Means, shall be placed at the disposal of the Minister of Agriculture for the support of cattle farmers who wish to employ tuberculin as a diagnostic remedy in combating tuberculosis among their cattle, the tuberculin test being applied according to detailed regulations issued by the Minister. The support shall be granted to none but such farmers as guarantee their ability to keep the animals proved by the test to be healthy safely isolated from the animals affected by tuberculosis, or which have not been subjected to the tuberculin test.

The Minister of Agriculture shall, on these conditions, be entitled to employ part of the sum to support cattle-breeding associations which wish to subject the animals selected for breeding purposes to the tuberculin test as well as to support farmers' associations desiring to subject cows belonging to cottagers to the tuberculin test.

Farmers who do not fulfil their obligations with regard to the isolation shall return to the State the grants which have been made to them in accordance with the above provisions.

Any veterinary surgeon superintending the application of the tuberculin test on a farm shall satisfy himself under penalty of a fine that safe isolation between the animals is established, and, if his orders to this effect are not obeyed by the farmer, he shall notify the chief veterinary surgeon of the country.

Applications from cattle farmers, cattle-breeding associations, and farmers' associations, desiring to take advantage of the opportunity offered to them by this act of having their cattle subjected to the tuberculin test, shall be sent direct to the Minister of Agriculture.

Section 2. Importation of live cattle from abroad shall take place only at such places as are mentioned in the regulations issued by the Minister of Agriculture. Immediately after their arrival, the animals shall be quarantined and shall, in accordance with the regulations of the veterinary police, be subjected to the tuberculin test, according to the regulations issued by the Minister of Agriculture, within five days after their arrival at the quarantine stable. After the test, the non-reacting animals shall be left at the disposal of the owner, while the reacting animals shall either be returned or taken direct to a public slaughter-house, or to a slaughter-house recognized by the Minister of Agriculture, where same shall be destroyed under control of the veterinary police.

The expense incurred in providing the requisite quarantine stables at the places of import, as well as the expenses of the tuberculin tests,—but none of the expenses attendant on the other measures mentioned in this section,—shall be borne by the state.

The regulations relating to tuberculin tests, mentioned in section I, shall also apply to such other diagnostic remedies as may be recommended by veterinary authorities for the combating of tuberculosis among cattle, and are approved by the Minister of Agriculture.

Section 3. Animals reported for killing purposes may be exempted from quarantining and the tuberculin tests ordered in section 2.

Such animals shall, after having been branded (sec. 4), be taken direct to a public slaughter-house or to a slaughter-house recognized by the Minister of Agriculture.

The Minister of Agriculture shall be entitled to permit cattle imported for killing purposes—after having been marked—being taken direct to a cattle-market, where the animals shall be stabled so as to be—in the opinion of the veterinary police—duly isolated from all other cattle. From this place they shall be taken direct to a public slaughter-house or to a slaughter-house recognized by the Minister of Agriculture.

The animals imported for killing purposes mentioned in this section shall be killed within ten days after their arrival in this country.

Section 4. The Minister of Agriculture shall issue regulations for the marking of the imported animals.

Section 5. Cows suffering from tuberculosis of the udder shall be killed, in accordance with the regulations of the state, under control of the veterinary police or in a public slaughter-house. The owner shall be entitled to a compensation for the animal, amounting to one third of the market value of the carcass, calculated at the current price, according to the regulations issued by the Minister of Agriculture. The owner shall further be entitled to a compensation for such parts of the animal as are declared by the veterinary surgeon to be unfit for human consumption, amounting to half of the value of the condemned meat, calculated as above. Such parts of the animal as are declared fit for human consumption shall be left at the disposal of the owner.

The compensation, as well as the expenses attendant on the killing, shall be paid by the state.

Section 6. None but such milk and butter-milk as has been heated to a temperature of at least 64 degrees Reaumur (80 degrees C.) shall be returned from dairies to serve as food for cattle and pigs. Exceptions from this rule may take place when the heating cannot be performed on account of an accident, which fact shall be made known to the persons to whom the milk is to be returned.

The heating mentioned in this section shall also apply to all cream destined for the making of butter for exportation.

The sediment scraped off the sides of the cream-separator, during the cleaning of the same, shall be burned.

Section 7. None but such milk and butter-milk as has been sufficiently proved, in the opinion of the Minister of Agriculture, to have been heated to a temperature of at least 64 degrees Reaumur (80 degrees C.) shall be imported from abroad. The Minister of Agriculture shall, however, be entitled to grant exemption from the above prohibition when special circumstances necessitate it.

Section 8. The carrying out of the provisions of this act shall be enforced by the veterinary police, the customhouse officers and the butter and margarine inspectors in accordance with the directions of the Minister of Agriculture.

Section 9. Offenders against the provisions of sections 1, 2, 3, 6, and 7 shall be liable to fines of from 10 to 20 Kr., for the first offence; in case of repetition, to fines of from 20 to 200 Kr. Repeated offences against section 6 shall not be looked upon as such if at least one year has elapsed since the offender was last fined. The fines shall accrue to the exchequer. The proceedings in these cases shall be summary. In the case mentioned in section 7, the prohibited articles shall be confiscated and heated to the temperature defined in the above section. In Copenhagen, the proceeds of the sale of such articles shall accrue to the municipal fund, in other places to the poor fund.

Section 10. This act, which shall not apply to the Faroe Islands, shall come into force October 1, 1904.

There are a number of small and larger villages and cities that have passed ordinances requiring that their milk supply shall come from cows that have passed the tuberculin test. These ordinances are not always carried out. The knowledge of tuberculosis and the action of tuberculin is constantly changing, so that legislation will of necessity vary from time to time if the best results are to be secured. More than this, the habits of the dairymen have much to do with the spread of tuberculosis.

Suggestions for legislation and control.

Legislation on bovine tuberculosis should tend, (1) to protect the herds of the state or country from the introduction of infected cattle; (2) to eliminate the disease as rapidly as possible from the infected herds; (3) to provide for a wise and equitable disposition of the infected animals; (4) to prevent, as far as possible, the spread of the disease by the sale of infected animals; (5) to educate the cattle-owners in the nature of the disease. The control of tuberculosis rests largely, in the last analysis, on the action of the owner of the cattle. With the present law in New York, the efforts to eradicate the disease are largely personal. The knowledge of the disease to be observed by the individual may be codified in the following rules:

(1) Protect the healthy herds by keeping all infected animals from entering them.

(2) Promptly eliminate all animals exhibiting tuberculous udders or evidence of generalized tuberculosis, thereby greatly reducing the danger from the milk.

(3) As quickly as possible, test with tuberculin all animals in the suspicious herds and segregate the reacting ones. Retest at frequent intervals until every infected animal is found and removed.

(4) Dispose of the reacting animals by one of the following methods: (1) destruction; (2) slaughter for beef under proper inspection; (3) isolation for breeding purposes after the Bang method.

(5) Never return to the sound herd animals that have reacted to tuberculin, although they cease to react and appear to be perfectly well.

(6) Change the practice of maintaining a milking herd by buying in fresh cows and selling the dry ones to keeping more of the cows during the dry period and raising more calves. This is important unless cows can be purchased from perfectly sound herds.

(7) Cattle should not be purchased for dairy purposes unless they pass the tuberculin test. They should not be accepted at all if the herd from which they come is extensively infected. The herd is the unit to be considered. All newly purchased animals should be carefully watched and retested.

MEAT-INSPECTION

By *John R. Mohler*

Protection of the public health, as manifested by the regulation of the meat-supply, is popularly supposed to be modern in origin. In reality, the subject of the inspection of meats is an old story, the telling of which began with Moses and was continued by the Egyptians, Phœnicians, Babylonians, Athenians, Romans and Mohammedans, and many others, before the present era.

From a perusal of the literature of the various countries, it becomes apparent that, in the early times, the views held by the various tribes and nations regarding the examination of meats were based as much on religious grounds, ancient prejudices and sacrificial observances, as on any sanitary or esthetic consideration. With the increase of industrial development during the middle ages, regulations regarding meat-consumption began to appear among the more modern European countries. It would be tedious to describe the growth of meat-inspection in these various countries, from the very primitive form that existed then to the scientific system based on the firm foundation of assured knowledge, which obtains today; and it is only desired to draw attention to the fact that a form of meat-inspection existed from the earliest times, and that, by a process of evolution that has gone on for centuries, the condition of things has been arrived at which obtains today. But the achievements of the last decade entirely eclipse all that was done before, and reforms have been effected not only in the United States, but also in Germany, Austria, Belgium, Holland and France; though the changes carried out in these latter countries have been less thorough than in the United States and Germany.

Progress in meat-inspection.

The solid foundation of scientific meat-inspection may be said to be the biological investigations, especially those of Leuckhart, of the meat-measles and trichinæ, which were of such widespread interest that they gave the subject great impetus. Gerlach's experiments regarding the danger to man from the consumption of meat of tuberculous animals, and Bollinger's investigations relative to the virulence of the meat of tuberculous animals, as well as his articles on the production of meat-poisoning in man from eating diseased meat, likewise showed the great public importance and necessity of such inspection as would eliminate these dangers. As a result of numerous investigations along these and similar lines, other countries, from time to time, have enacted laws governing the inspection of meat, until, at present, legislation on this subject has been adopted by the following countries: Austria-Hungary, Belgium, Canada, France, Germany, Holland, Italy, New Zealand, Roumania, Spain, Switzerland, and the United States. It will therefore be seen that a healthful and wholesome meat-supply is becoming more and more sought after, and in numerous places, such as Denmark, England, Japan, Russia, Scotland and Sweden, efforts are being made to control, and thereby to improve it.

Without question, the problem connected with the procurement and maintenance of a hygienic food supply for the people is one of the most important subjects with which the sanitarian has to deal. Public health demands the purity of animal food products. The vast quantity of meat consumed in the United States, where this food-stuff is plentiful and comparatively low in price, renders it of essential importance that nothing but innocuous and nutritious meat products be placed on the market. The amount of meat *per capita* used annually by various countries was computed by the Agricultural Department in 1907, when it was found that in the United States an average of 185.8 pounds was consumed by every inhabitant,—a ratio surpassed only by Australasia, where meats are more abundant and cheaper in value.

Assuming the approximate correctness of the following estimates, it would appear that meat-consumption *per capita* has gradually increased in this country since 1890, when each person was credited by the English Bureau of Statistics with consuming 119.7 pounds; while in 1899 Mulhall, in his Dictionary of Statistics, estimates this consumption at 141 pounds; and in 1900 Roberts places it at 178 pounds. Furthermore, it is estimated that meat constitutes about thirty per cent of our total nutritive material and costs about thirty per cent of the total. To satisfy this domestic demand, and to supply the foreign orders for meat, there has rapidly developed in our midst a business, the value of whose products in 1900 was estimated at over $810,000,000, and which, among our immense industries, ranks second as to the aggregate worth of yearly exports. These facts, together with our knowledge, authentically established, of the communicability to man of many animal diseases, compel us to recognize the urgent demand for a hygienic meat supply — a supply that is clean, wholesome and absolutely free from disease.

Diseased meats.

The matter of drawing hard and fast lines by which carcasses are to be passed for human food or condemned for fertilizer is one attended with considerable difficulty. Animals showing such conditions as advanced pregnancy, anemia, emaciation, fever and abscess formation, are samples of cases in which authorities disagree on the proper disposition of the carcasses. The flesh from such animals, even though the diseased parts are carefully removed, is not so nutritious as that taken from healthy animals; and yet experience has shown that human beings have in many cases consumed meat from badly diseased animals with impunity. However, such meat is loathesome to the American public, and this feeling is respected by the federal meat-inspection regulations, which are more stringent than those of any other country, having a rigid method of inspection.

Certain human parasites spend the larval, or intermediate stage of their life-cycle, in the bodies of certain food-producing animals; and, in case such animals' flesh is eaten, the larvæ develop into adult parasites in the human intestine. Tapeworms are probably the most common parasites so transmitted. Meat from the hog infested with the larval stage of one variety of this parasite is commonly known as measly pork, and contains small spherical white areas, the so-called measles in the muscular tissues. If the meat is eaten uncooked by human beings, the capsule of the measle is digested, and the liberated larvæ develop into the *tænia solium* of man. Beef affected with another species of parasite is similarly termed measly beef, and, if eaten, the encysted larvæ develop into the *tænia marginata* (tapeworm) in the human intestine.

Trichinosis, a disease simulating muscular rheumatism, is caused from eating pork affected with the larval forms of *trichina spiralis*. When such meat is ingested, the embryos develop into adult sexual parasites which remain in the intestine. They undergo multiplication, however, and the embryos thus produced bore their way through the intestinal walls, to become dispersed throughout the voluntary muscular system, where they become encysted and remain for years. They act as a foreign body, give rise to slight inflammatory reaction, and the production of more or less severe muscular pains, which are extremely baffling to treatment.

Certain vegetable organisms, including the bacteria, produce disease in animals which are communicable to man through the ingestion of flesh from affected animals. It is generally believed that tuberculosis can be so transmitted, and the ray fungus, or *actinomyces*, the cause of actinomycosis of cattle, commonly known as lumpy jaw, is also virulent for the human family. Carcasses of animals affected with or dead of anthrax contain the causative organisms in large numbers, and hence are dangerous for human beings, as are the products of animals affected with rabies.

The fact that this method of transmission of disease to human beings is constantly kept at a minimum is due largely to two factors, namely, the federal, state and city meat-inspection conducted in the various abattoirs and slaughtering houses of the country, and the general practice of thoroughly cooking all meats before they are served.

The new meat-inspection law.

The United States government, thoroughly aware of the danger to health from consuming meat that is unfit for food, has recently passed an elaborate and comprehensive law for controlling this danger. The acts of Congress of 1890, 1891 and 1895 provided for the inspection of meats entering interstate or export commerce, but the annual appropriations had never been sufficient to enable the government to cover all the establishments slaughtering for interstate trade, although all meat exported was being inspected in a manner satisfactory to foreign governments. While palpable defects in the old law had been frequently called to the attention of Congress by the Department of Agriculture, it remained for a sensational press so to exaggerate the conditions as to call immediate attention to the defective features of the existing law. As a result, an awakened public, led by the President of the United States, demanded an improved law, and on June 30, 1906, Congress passed an eminently satisfactory act which assures a wholesome and hygienic meat supply to the people, for the enforcement of which a permanent yearly appropriation of $3,000,000 is made, a sum that will permit of its efficient and continued enforcement.

Meat-inspection in Canada.

Meat-inspection in Canada is only of recent origin. There was no government control maintained in Canada in connection with the meat-food products until the necessity for such action was brought to the attention of the people through the meat-inspection agitation in the United States.

Then the parliamentary authorities passed a Meat-Inspection Bill, in September, 1907, which provides for a competent meat-inspection service, not alone for the increasing export trade in meat and meat-food products, but likewise for the control of the meat supply destined for home consumption.

Accordingly, in order to provide a sufficient number of well-trained veterinary inspectors for this work, arrangements were made through the Veterinary Director-General for a special course of instruction in meat-inspection in one of the veterinary colleges in the United States, located near a large packing center. Thus the Canadian veterinarians were admitted daily to the large abattoirs, and were paired with the inspectors of the Bureau of Animal Industry, in order that they should acquire a most valuable practical knowledge of the duties required by the Canadian government. At the same time a full course of lectures was given to the students on the scientific aspect of meat-inspection.

The requirements for the appointment as veterinary inspector in Canada are practically the same as in the United States. Graduates of recognized veterinary colleges are required to pass a special examination on veterinary branches.

The regulations governing meat-inspection in Canada follow the same lines as those in force at the present time in the United States. They provide for an ante- and post-mortem inspection of all food animals slaughtered in an establishment where government inspection is maintained, as well as strict sanitation of those establishments. The principles in the judgement of carcasses are also similar to those adopted in the United States meat-inspection regulations.

Forms of meat-inspection.

In the United States, the inspection of meats is conducted by the federal government, by the state or by the municipality. Inspection by the United States government has gradually been extended and improved since its inauguration by the law of 1890, until at present the federal meat-inspection law, which is enforced by the United States Bureau of Animal Industry, is as advanced a measure as could be desired and is perhaps the most rigid and comprehensive of existing laws on the subject. Under this law, meat-inspection proceeds by logical steps, commencing with the careful examination of the live animal, continuing with the inspection of the carcass while being dressed, the supervision of all meats used for curing, pickling, smoking, cooking, canning, or for sausage, and finally with the proper, honest labeling of all meat or meat products, so that the consumer knows precisely what is in the package he purchases. Furthermore, the Government inspector must require sanitary surroundings and methods in the establishments where inspection is maintained and must prevent the use of harmful chemicals, preservatives or dyes in the food products. All meat and meat products that have successfully passed such careful examinations by the inspectors are marked "U. S. Inspected and Passed," and such meat may enter into interstate or foreign commerce.

The only other meat that can legally be shipped across the state lines is that produced by the farmer on his farm, and the product sent out by retail dealers and retail butchers to their customers. Such traffic, however, is still under the supervision of the government although it is exempted from inspection, and each interstate shipment of this exempted meat must be accompanied by a certificate stating that the meat is sound, wholesome and fit for human food. Closer supervision is had on the retail butcher and retail dealer by giving them an exemption number, which must appear on their certificates. If meat unfit for food is sent under such exemption into interstate commerce, the shipper is liable to punishment by fine or imprisonment. For these three exempted classes, state inspection should be inaugurated as has been done in Pennsylvania, and the work of examining meats taken up where the government inspection leaves off. In fact, the federal inspection should be supplemented not only by the state inspection but by the municipal inspection as well, which would include the inspection of: (1) the small slaughter-houses which do only a local business; (2) the commission houses and sausage factories; (3) the retail butcher shops.

There are instances that have come under observation when cattle suspected of being diseased were not bought in the large stock-yards for immediate slaughter, but were obtained by dealers at a low price for shipment to butchers in adjoining states for slaughter in establishments without federal inspection. One of these butchers has stated that, since the new meat-inspection law went into effect, he has been getting more diseased cattle than ever before; and this meat, of course, is being consumed by an unsuspecting public.

The care displayed by a buyer for an abattoir having inspection, in culling out these suspected cattle, is regrettable when it is appreciated that these same animals are bought and slaughtered and the meat put on the market without inspection. And furthermore, the great increase in the number of official abattoirs under the new law has been the cause of sending many of the suspected and perceptibly diseased cattle formerly killed in these newly added official abattoirs to the local slaughter-houses, where they are not in danger of being condemned and tanked for fertilizers. If, as the records show, there are .5 per cent of the cows and 1.5 per cent of the pigs that are slaughtered in official abattoirs found to be tuberculous, what must be the percentage of tuberculous animals slaughtered in local slaughter-houses where the carcasses are not inspected; and how great must be the danger from such meats?

That the inspection of meats is even more necessary at the smaller than at the larger plants of the country, is indicated by the comparative results of the past year. At the smaller plants doing an interstate business, and which came under inspection with the new inspection law, over .5 per cent of the cattle inspected were tuberculous; while larger plants which had received inspection previous to the new law showed only .25 per cent, or about one-half as many as the former plants for the same period of time. This difference is undoubtedly due to the fact that the large plants killed a good proportion of range cattle, which are remarkably free from tuberculosis; while the smaller plants killed a much greater proportion of dairy cows, which are frequently filled with tuberculosis.

Does it not, therefore, seem logical to presume that the local slaughter-house is more badly in need of inspection than the small plant above referred to? One frequently buys with pride, meat labeled "home-killed" or "home-grown," but, in the absence of federal, state or municipal inspection, this means that the animal was killed without scientific inspection either before or after slaughter. Furthermore, it too often means that the animal was killed in a little shack termed a slaughter-house, without running water, without sewerage, without windows or ventilation, and without the merest pretext of cleanliness. Is it not reasonable to suppose that the dealer having a diseased animal will send it to such a slaughter-house rather than to a neighboring plant under inspection, where it must receive appropriate inspection and take the risk of being condemned as unfit for food? Is it not apparent that the whole tendency is toward the selection of only healthy-appearing animals for the abattoir under inspection, and a diversion of diseased and suspicious cases to the uninspected local slaughter-house?

The necessity for state and municipal inspection may be appreciated when it is understood that the government has no power to inspect meats that do not leave the confines of the state. The facts are, however, that, in localities where abattoirs have federal inspection, much of the meat used for city trade or for shipment within the state, as well as the products which enter interstate commerce, is inspected by the government. But meat inspected may become contaminated, be subjected to insanitary conditions, or become putrid or repulsive, from various causes, after it has passed beyond the jurisdiction of the federal inspector. It is therefore important that municipal and state inspection laws be on the statutes, to take cognizance of such unhygienic conditions or changes in the flesh, and to require market inspection in addition to ante- and post-mortem examination.

However, the great danger that menaces the public health arises, not so much from meat contaminated after inspection as from uninspected meat, produced in the numerous unclean and ill-smelling private slaughter-houses so frequently found on the outskirts of a number of our cities. To control the latter, and to control them efficiently, it is essential that laws be enacted for the proper supervision of these establishments, which kill at all hours of the day and night, as inclination dictates or necessity demands. The regulations, thereof, should insist that the viscera and their lymphatic glands must be retained after their removal from the carcass, until examined by the inspector, and their connection with the carcass appropriately noted. Inspection that includes merely the dressed carcass is unworthy of the name and extremely delusive, as it gives a false impression of security to the consumer. These houses should, also, be compelled to kill only on certain days or hours, in order to permit the inspector to be present. All the butchers should be licensed, and likewise their abattoirs, which should come up to a certain prescribed standard. A far better law, and one which would receive the endorsement of all sanitarians, would ordain the abolition of these small buildings, and the establishment of a public slaughter-house, as in Montgomery, Ala., remote from the center of the city and its business section, where a thorough inspection by a veterinarian could be made of all animals. Such an abattoir, under rigid, though rational restrictions, would be beneficial, not only in facilitating the business, but in promoting the sanitary interests of the city, as all the offal could be disposed of at once, and all parts of the carcass, not edible, could be reduced to inoffensive articles of commerce.

In some cities where the inspection is enforced by laymen, such as butchers, cattlemen, or men even more disconnected with the practical part of the work, the result is seriously handicapped because of their inability to recognize lesions that at once would appeal to one trained in anatomy, physiology and pathology of the domesticated animals, and in the relationship existing between their diseases and human health. If an adequate reason for municipal inspection exists,—and no one of intelligence will deny it,—this should possess equal strength for having the law intelligently and efficiently enforced by capable officers of the law, trained in the knowledge of sanitation and comparative medicine. It is only a question of time when every town and city, of any size, will arise from their sanitary lethargy, as a direct result of the education of public opinion along this line, and will have an organized and compulsory system of municipal inspection, supervised by one skilled in veterinary science. And the adoption, as well as the success, of such inspection will depend, to a great extent, on the interest shown and the support given it by the people of the country.

THE FOOD AND DRUGS ACT

By *H. W. Wiley*

A study of the Food and Drugs Act of June 30, 1906, properly begins with a brief historical account of the evolution of legislation of this kind and the causes thereof. The adulteration of foods and drugs has been practiced from the earliest antiquity, and there are many instances of ancient laws and early English and Continental laws relating to such subjects.

History of food laws.

In the books of Moses are instances of sanitary regulations, referring chiefly to animal foods. A food law is found in Deuteronomy XIV: 21:

"Ye shall not eat of anything that dieth of itself; thou shalt give it unto the stranger that is in thy gates, that he may eat it; or thou mayest sell it unto an alien; for thou art a holy people unto the Lord thy God. Thou shalt not seethe a kid in his mother's milk."

In Plato it is provided:[1]

"The wardens of the market and the guardians of the law shall obtain information from experienced persons concerning the rogueries and adulterations of the sellers, and shall write up what the seller ought and ought not to do in each case."

In England.—Among the earliest English laws relating to the adulteration of food and drink are 51 Henry III and a statute of Edward I which were repealed by 6 and 7 Victoria ch. 24, in 1844. The important point to be considered as underlying the very essence of legislation on this point is that of the common law. A person selling adulterated or harmful foods may be prosecuted, if intent to deceive or injure can be proved, but under the common law the principle of *caveat emptor* prevails,—in other words, that the purchaser must look out for himself, to see that he is not cheated. Under all the modern statutes relating to adulterated foods and drugs, however, this is all changed, and the vender is made the responsible party. It is seen, therefore, that the statute law is a greater protection to the purchaser than the common law.

A synopsis of the principal acts of the British Parliament follows:

The Adulteration of Coffee Act, 1718. Section 23 provides a penalty of 20 pounds "against divers evil-disposed persons who at the time or soon after the roasting of coffee, make use of water, grease, butter, or such like material whereby the same is made unwholesome and greatly increased in weight, to the prejudice of his Majesty's Revenue, the health of his subjects, and to the loss of all honest and fair dealers."

The Adulteration of Tea and Coffee Act, 1724, provides a penalty of 100 pounds, and forfeit, for counterfeiting or adulterating tea.

The Adulteration of Tea Act, 1730, provides a penalty of 10 pounds for every pound of sophisticated tea found in possession or sold.

The Adulteration of Hops Act, 1733, relates to the sophistication of beer.

The Adulteration of Tea Act, 1776.

The Sale of Food and Drugs Act, 1875.

The Sale of Food and Drugs Amendment Act, 1879.

The Customs and Inland Revenue Act, 1882, relates to imitation of coffee, and coffee mixtures.

The Margarine Act, 1887.

The Sale of Food and Drugs Act, 1899.

The Butter and Margarine Act, 1907.

Public Health (regulations as to food) Act, 1907.

The Food and Drugs Act of 1899, in connection with the original acts of 1875 and 1879, is the one now in force in England. The statute provisions of the English act now in force are of comparatively recent date. They are stated by Hall and Pickering in their work on the Law of Food Condemnation:

"The vender of poisonous or unwholesome meat has never enjoyed complete immunity. It was regarded as an offence punishable at common law to sell for human consumption poisonous or unsound meat. The evidence of the unwholesome qualities of the food usually relied on in behalf of a prosecution under the common law were the symptoms subsequently exhibited by the consumer. The action of the common law was, therefore, somewhat tardy. It was necessarily retrospective and retributive; modern statutory enactments strive to be anticipatory and protective. This punishment, at the hands of the common law, of the vender of unwholesome meat for human consumption, was rendered possible by the fact that such trafficking was regarded as a 'nuisance.' It was, of course, not a 'nuisance' to sell unwholesome food for any other purpose than for the food of man; nor even to sell it for export only. The provisions of the common law, though to a great extent superseded by recent legislation, are still in force, and may be resorted to when an alleged offense is punishable at common law, and the statutory penalty which could be imposed is considered to be insufficient. Where, for instance, food is sold containing poisonous ingredients, which are the cause of the death of the consumer, the vender is liable to be indicted for manslaughter. To support such an indictment at common law, the prosecution must produce some evidence tending to show that the vender knew that the food at the time of the sale was unwholesome."

In the United States.—Attention should be called to the voluminous legislation of the states; but it is impossible to give even a synopsis of this legislation in the scope of the present article. In the Statutes at Large of the Colony of Virginia, collected by Mr. William Waller Hening, being from the first session of the legislature in 1619, the following interesting statement of the earliest legislation of the colonies against food adulteration is found:

"Att a

Grand Assembly

"Holden att James Citty the twentieth of November, 1645.

"Present Sir William Berkeley, Kn't, Governour, & C.

"Act II

"*Whereas* there hath been great abuse by the unreasonable rates exacted by ordinary keepers and retailers of wine and strong waters,

"*Be it enacted* that no person or persons whatsoever retailing wines or strong waters shall exact or take for any Spanish wines (vizt.) Canary, Mallego, Sherry, Muskadine, Alegant or Tent above the rate of 30 pound of tob'o. per gall. And ffor Maderea and Fyall wine about 20 pound of tob'o. per gall. And for all ffrench wines above the rate of 15 lb. tob'o. per gall. And for the best sorte of all

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[1] Laws, Book XI, Par. 917 (written 350 B. C.)

English strong waters above the rate of 80 lb. of tobacco per gall. and for aqua vitae or brandy above the rate of 40 lb. tob'o. per gallon.

"And if any person or persons retaileing wines or strong waters as aforesaid shall fraudulently mix or corrupt the same, upon complaint and due proofe made thereof before two commissioners whereof one to be of the quorum, The said commissioners shall by warrant under their hands comand the constables to stave the same, And if any shall take more than such rates sett they to be ffined at double the values of such rates soe exacted."

Food laws in the United States.

Practically every state and territory, including the District of Columbia and insular possessions of the United States, has enacted food and drug laws. During the year ended June 30, 1907, seven states and the Philippine islands, which had previously made practically no attempt to control the character or quality of their foods, enacted new laws, with officers to make their enforcement possible. New laws were also enacted in three states, which will probably not be enforced because of the failure to provide enforcing officers or appropriation. Of the fifty-three states and territories in the United States, including the insular possessions, forty-two are fully equipped with laws and machinery for enforcing them. Of the remaining states, three have laws but no enforcing officer or appropriations. Only eight of the whole number have no general laws on the subject, but in those eight there are many municipal and other laws relating to the regulation of the sale of foods and drugs.

A compilation of state and federal laws was issued in 1905 by the Department of Agriculture as Bureau of Chemistry, Bulletin No. 69, Parts I–IX, and is supplemented yearly by the issuance of additions and amendments. The food laws of the states conform more or less to the national food law. Twenty-one of the states have revised their food laws since the passage of the national act, and based their new laws on the provisions of that act. The laws of the states are enforced in different ways. In some of the states, the officer enforcing the law is the director of the agricultural experiment station of the state, as, for example, in the state of Kentucky; in other states the laws are enforced by the board of health, as in the case of Indiana; in other states by a commissioner elected by the people, as in the state of Ohio; while in still other states the law is enforced by a commissioner appointed by the governor, as in the case of Pennsylvania. In addition to the state laws, each food or drug commissioner of the state, or territory, no matter how appointed, is authorized to collaborate with the Department of Agriculture in the enforcement of the national law. Thus the state laws are made more efficient by the power of the commissioner to act outside of the state law under the national act to punish the person who has sent adulterated or misbranded food into the state.

National laws.—In 1848, the first national legislation relating to the control of drugs was enacted. Prior to this, in 1821, in the establishment of the Philadelphia College of Pharmacy, attention was called to the fact that one of its chief objects was to direct attention to the quality of drugs brought into the market. In the report which accompanied the drugs bill which was enacted in 1848, it is stated:

"Communications of such importance, emanating from sources so respectable, could not but receive our careful consideration. As a specimen, we subjoin the petition and memorial of the American Medical Association, which assembled in Baltimore during the present month. A body of more highly gifted, or honorable men, has never assembled for any purpose. Deeply impressed with the importance of the subject, they ask at the hands of Congress, legislative action as the only effective means of relief. The petition is as follows:

"'The memorial of the American Medical Association, consisting of delegates from the several states in the Union, at their annual meeting in Baltimore, assembled May, 1848, respectfully represents: That it has become notorious among druggists, apothecaries, and physicians, that of late important drugs and medicines are specially adulterated in foreign countries for sale in this, and pass daily through the custom-house to be disseminated by ignorant and unprincipled dealers, to the great detriment of our citizens.'"

The legislature of the state of Mississippi in March, 1847, memorialized Congress to pass the Drugs Act in the following language:

"Whereas it has been represented to this legislature that of late important drugs and medicines are specially adulterated in foreign countries for sale in the United States and pass daily through the custom-houses, to be disseminated by ignorant or unprincipled dealers, to the great detriment of the people: Therefore be it

"Resolved, That our Senators in Congress be instructed and our representatives be requested to introduce and advocate the passage of a law for the appointment of a qualified inspector at each of the custom-houses of the United States, whose duty it shall be to ascertain the real character of all drugs and chemicals imported and destined for medical use, and to impose suitable penalties for the importation of any such drugs and chemicals in an adulterated state."

The report accompanying the bill showed numerous adulterations of drugs. After reciting many illustrations it continued:

"Thus might your committee continue through the whole catalogue, as most of the fine medicinal chemicals are prepared of unequal strength and purity for the purpose of cheapening their cost, thereby rendering them less effective and more uncertain in the treatment of disease, and in some cases actually dangerous to the patient, as well as obviously unjust and greatly embarrassing to the physician. We will, here, however, proceed no further, believing that the facts already set forth respecting very many of our most important medi-

Plate XXII. A contrast of fifty years. "College Hall," Michigan Agricultural College, East Lansing, in 1857 and 1907

cines and those in daily use, will, if fully understood, satisfy your honorable body of the imperative necessity of the passage of a law calculated effectually to put a stop to this reckless and murderous trifling with human life for the sake of filthy lucre. Every feeling of humanity, as well as regard to justice, toward those who are intrusted with the lives of the people demands this at your hands."

This law, so salutary in its character, has remained in force ever since, and is still in force, being executed in connection with the Food and Drugs Act of June 30, 1906.

Additional legislation in this line, referring to antitoxic serums, was enacted by Congress and approved July 1, 1902, in which the examination of all antitoxic serum of every description is placed under the supervision of the Medical Departments of the Army, Navy, and the Public Health and Marine Hospital Service.

An active propaganda against the adulteration of food was begun in the decade of 1870-80, and in the session of Congress beginning in December, 1880, at least two bills relating to the adulteration of food were introduced in the House of Representatives. One of them, H. R. 7005, was referred to the Committee on Epidemic Diseases and its purpose was to authorize the President to appoint a commission to examine into and report on the adulteration of food and other articles in the United States. The bill was favorably reported on February 4, 1881, by Mr. Casey Young, and referred to the House calendar to be printed. The report contained the following statements:

"That they have investigated, so far as they could with the time and opportunities they have had at their command, the injurious and poisonous compounds used in the preparation of food substances, and in the manufacture of wearing apparel and other articles, and find from the evidence submitted to them that the adulteration of articles used in the everyday diet of vast numbers of people, has grown to and is now practiced to such an extent, as to seriously endanger the public health, and to call loudly for some sort of legislative correction. Drugs, liquors, articles of clothing, wall-paper, and many other things, seem to be subjected to the same dangerous process. The legislation required to meet the end is of too important a character, the committee think, to be entered upon without a fuller investigation than any committee of Congress could give it, and it is therefore necessary for a commission to be appointed, as provided in the bill, to make a thorough and minute examination of the entire subject, aided by the necessary scientific appliances.

"The committee have derived much information on the subject from Mr. George T. Angell, of Boston, who has devoted many years to its study and investigation, and to the collection of a large number of facts and statistics connected with it, which he embodied in a paper submitted to the committee, and which is attached as exhibit A to this report.

"The committee recommend that the bill be passed."

The paper submitted by Mr. Angell is a very interesting one, and contains practically all that was known at that time on the subject of adulteration. All the common adulterations which have since been practiced were mentioned. Especially were the adulterations of baking-powders, coffee, vinegar, confectionery, spices, glucose and sugar very thoroughly exploited.

In 1879, the national Board of Trade offered a prize of $1,000 for the best essay on the adulteration of food. Four essays were selected as worthy of publication. One of these was written by Mr. G. W. Wigner, an Englishman, who treated the matter solely from the English point of view. The second essay which was selected for publication was written by V. M. Davis, of New York City, who concludes as follows:

"We believe it is no exaggeration to say that adulteration is practiced wherever opportunity offers and pecuniary profit or commercial advantage is made thereby."

The third paper was written by Dr. William H. Newell, of Jersey City, N. J., and the fonrth by Dr. O. W. Wight, Commissioner of Public Health, of Milwaukee.

The House Bill 7005, to which reference is made in the above report is as follows:

"*Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled*, That the President is hereby authorized and empowered to appoint a commission, consisting of three persons, learned in chemistry and sanitary science, to investigate and report upon the adulteration of food and other articles, in the United States, who shall hold office for the period of one year unless sooner removed by the President, and shall receive a salary of three thousand dollars per annum and necessary traveling expenses. Said commission shall be allowed a clerk, who shall be a stenographer, and receive a salary of two thousand five hundred dollars per annum; and for the purpose of carrying out the provisions of this act the sum of twenty thousand dollars, or so much thereof as may be necessary, is hereby appropriated out of any money in the Treasury not otherwise appropriated; and these officers shall be sworn officers."

The first national legislation of a non-taxing kind relating to foods, except as to tea, was an act of July 1, 1902, which provided:

"That no person or persons, company or corporation, shall introduce into any State or Territory of the United States or the District of Columbia from any other State or Territory of the United States or the District of Columbia, or sell in the District of Columbia or in any Territory any dairy or food products which shall be falsely labeled or branded as to the State or Territory in which they are made, produced, or grown, or cause or procure the same to be done by others."

This act was incorporated in the Food and Drugs Act in practically the same terms, and, although it has never been repealed, may be regarded as having been superseded by the Food and Drugs Act itself. This act was the result of an agitation which continued almost without intermission for twenty-five years, the sentiment in favor of it becoming stronger and stronger with each succeeding year.

During this time, a great many bills were introduced into Congress, proposing to regulate interstate commerce in foods and drugs. Some of the more important of these bills are the following:

The first law relating to the adulteration of teas was approved March 3, 1883. This law was repealed by the Act of March 2, 1897, which is still in force in connection with the enforcement of the Food and Drugs Act.

By this act the importation of inferior teas was prohibited from and after May 1, 1897. The act provided for the creation of a Board of Tea Experts to fix standards of tea, and provided also that the Secretary of the Treasury, on the recommendation of the board, should fix and establish uniform standards of purity, quality, and fitness for consumption of all kinds of teas imported into the United States.

The inspection of meats under the control of the Bureau of Animal Industry was provided for in the act of August 30, 1890; amended in the act of March 3, 1891, and still further amended in the act of March 3, 1895. The present inspection law, in which the principle of inspection is extended very largely, and which forbids interstate commerce in meats and meat food products without inspection, was approved June 30, 1906. [See article by Mohler, pages 493–496.]

The use of oleomargarine as an adulterant was also regulated by the act of August 2, 1886, amended by the act of May 9, 1902, laying a tax on oleomargarine, renovated butter, and adulterated butter.

On June 6, 1896, an act was passed taxing filled cheese, that is, cheese from which the butter-fat has been extracted and other oils or fat substituted.

The act of June 30, 1898, laid a tax on mixed flours, that is the adulteration of wheat flours with the flours of other cereals.

The Food and Drugs Act of the United States is modeled largely on similar legislation in Great Britain. One of the earliest of these was introduced by Mr. Faulkner of West Virginia, and afterwards a bill introduced by Mr. Paddock was substituted, which was offered to the Senate on June 30, 1890. This bill passed the Senate, but did not pass the House. All together, there is a record of thirty-two bills to regulate interstate and foreign commerce, which were introduced into the House of Representatives between December 18, 1899, and January 16, 1906. During this same period, there is a record of thirty-two such bills introduced into the Senate. Mr. Faulkner reintroduced his bill into the Senate on March 2, 1898, and a favorable report was made recommending its passage, on March 16, 1898.

The Senate bill, introduced by Senator Heyburn, passed the Senate on February 21, 1906, and was the bill, with amendments, which finally passed the House and became a law on June 30, 1906.

A bill introduced by Mr. Brosius in 1900 was reported favorably to the House but failed to pass. The bill reported by Mr. Hepburn in December, 1903, passed the House of Representatives on January 19, 1904, but failed to receive favorable action in the Senate. The bill which finally became a law on June 30, 1906, was composed largely in the Committee on Conference, the bills which passed the Senate and House being quite unlike in form, but the same in spirit.

The above brief account of legislation does not include those revenue bills, the chief object of which is the regulation of foods. Among these may be mentioned the Oleomargarine Bill, which was passed on August 2, 1886, and amended on May 9, 1902, and also the bills regulating filled cheese, passed on June 6, 1896, and mixed flours, passed June 13, 1896. All these measures had for their object, not the raising of the revenue, but the regulation of adulterated and misbranding of food products. The revenue acts, the purpose of which is primarily the raising of revenue, had more or less of a regulating nature from the adulterating and misbranding standpoint, especially the laws relating to the collection of internal revenue on distilled and fermented beverages. These laws have numerous regulations relating to the misbranding and adulteration of products of this kind, and impose penalties for the practice thereof.

It would be invidious to mention the members of Congress who were particularly effective in the passage of these bills, because so many took part therein, but it is only fair to mention a few of the leaders. In the Senate were Senators Faulkner, Paddock, Mason, McCumber and Heyburn; in the House, Representatives Sherman, Brosius, Hepburn and Mann. These are only a few, however, who took a very active part in securing legislation.

General principles involved in the present law.

There are two important principles which form the foundation of the Food and Drugs Act. One is that nothing injurious shall be added to food products, and nothing shall be added to drug products which will diminish their value and quality. The second is that no false statement of any kind shall be made respecting the nature of foods or drugs.

The first principle, it will be seen, relates to what is known as adulteration, and the second relates to misbranding. The Food and Drugs Act defines both foods and drugs in the following terms:

"Sec. 6. That the term "drug," as used in this Act, shall include all medicines and preparations recognized in the United States Pharmacopœia or National Formulary for internal or external use, and any substance or mixture of substances intended to be used for the cure, mitigation, or prevention of disease of either man or other animals. The term "food," as used herein, shall include all articles used for food, drink, confectionery, or condiment by man or other animals, whether simple, mixed, or compound.

"Sec. 7. That for the purpose of this Act an article shall be deemed to be adulterated:

"In case of drugs:

"First. If when a drug is sold under or by a name recognized in the United States Pharmacopœia or National Formulary, it differs from the standard of strength, quality, or purity, as determined by the test laid down in the United States Pharmacopœia or National Formulary official at the time of investigation: *Provided*, That no drug defined in the United States Pharmacopœia or National Formulary shall be deemed to be adulterated under this provision if the standard of strength, quality, or purity be plainly stated upon the bottle, box, or other container thereof although the standard may differ from that determined by the test laid down in the United States Pharmacopœia or National Formulary.

"Second. If its strength or purity fall below the professed standard or quality under which it is sold.

"In the case of confectionery:

"If it contain terra alba, barytes, talc, chrome yellow, or other mineral substance or poisonous color or flavor, or other ingredient deleterious or detrimental to health, or any vinous, malt, or spirituous liquor or compound or narcotic drug.

"In the case of food:

"First. If any substance has been mixed and packed with it so as to reduce or lower or injuriously affect its quality or strength.

"Second. If any substance has been substituted wholly or in part for the article.

"Third. If any valuable constituent of the article has been wholly or in part abstracted.

"Fourth. If it be mixed, colored, powdered, coated, or stained in a manner whereby damage or inferiority is concealed.

"Fifth. If it contain any added poisonous or other added deleterious ingredient which may render such article injurious to health: *Provided*, That when in the preparation of food products for shipment they are preserved by any external application applied in such manner that the preservative is necessarily removed mechanically, or by maceration in water, or otherwise, and directions for the removal of said preservative shall be printed on the covering or the package, the provisions of this Act shall be construed as applying only when said products are ready for consumption.

"Sixth. If it consists in whole or in part of a filthy, decomposed, or putrid animal or vegetable substance, or any portion of an animal unfit for food, whether manufactured or not, or if it is the product of a diseased animal, or one that has died otherwise than by slaughter.

"Sec. 8. That the term 'misbranded,' as used herein, shall apply to all drugs, or articles of food, or articles which enter into the composition of food, the package or label of which shall bear any statement, design, or device regarding such article, or the ingredients or substances contained therein which shall be false or misleading in any particular, and to any food or drug product which is falsely branded as to the State, Territory, or country in which it is manufactured or produced.

"That for the purposes of this Act an article shall also be deemed to be misbranded:

"In case of drugs:

"First. If it be an imitation of or offered for sale under the name of another article.

"Second. If the contents of the package as originally put up shall have been removed, in whole or in part, and other contents shall have been placed in such package, or if the package fail to bear a statement on the label of the quantity or proportion of any alcohol, morphine, opium, cocaine, heroin, alpha or beta eucaine, chloroform, cannabis indica, chloral hydrate, or acetanilide, or any derivative or preparation of any such substances contained therein.

"In the case of food:

"First. If it be an imitation of or offered for sale under the distinctive name of another article.

"Second. If it be labeled or branded so as to deceive or mislead the purchaser, or purport to be a foreign product when not so, or if the contents of the package as originally put up shall have been removed in whole or in part and other contents shall have been placed in such package, or if it fail to bear a statement on the label of the quantity or proportion of any morphine, opium, cocaine, heroin, alpha or beta eucaine, chloroform, cannabis indica, chloral hydrate, or acetanilide, or any derivative or preparation of any of such substances contained therein.

"Third. If in package form, and the contents are stated in terms of weight or measure, they are not plainly and correctly stated on the outside of the package.

"Fourth. If the package containing it or its label shall bear any statement, design, or device regarding the ingredients or the substances contained therein, which statement, design, or device shall be false or misleading in any particular: *Provided*, That an article of food which does not contain any added poisonous or deleterious ingredients shall not be deemed to be adulterated or misbranded in the following cases:

"First. In the case of mixtures or compounds which may be now or from time to time hereafter known as articles of food, under their own distinctive names, and not an imitation of or offered for sale under the distinctive name of another article, if the name be accompanied on the same label or brand with a statement of the place where said article has been manufactured or produced.

"Second. In the case of articles labeled, branded, or tagged so as to plainly indicate that they are compounds, imitations, or blends, and the word 'compound,' 'imitation,' or 'blend,' as the case may be, is plainly stated on the package in which it is offered for sale: *Provided*, That the term blend as used herein shall be construed to mean a mixture of like substances, not excluding harmless coloring or flavoring ingredients used for the purpose of coloring and flavoring only: *And provided further*, That nothing in this act shall be construed as requiring or compelling proprietors or manufacturers of proprietary foods which contain no unwholesome added ingredient to disclose their trade formulas, except in so far as the provisions of this act may require to secure freedom from adulteration or misbranding."

A perusal of these provisions of the law will show that it is founded on the broad principles of ethics. It is a legal enactment of the well-known phrase, "honesty is the best policy." The plain purpose of the act is that foods should be made solely of foods, and drugs of drugs. Articles which are not foods, under the broad definition of the term "food" in the act, are, not in expressed terms but by indirection, forbidden to be added to foods. Colors cannot be added to foods except when they are harmless and when they do not conceal inferiority. Under this distinction, it is seen that chemical preservatives, which by the great majority of investigators are believed, and have been proved, to be harmful, cannot be added to foods. If these substances be harmful, they cannot be added in small quantities, because they have no food value, they perform no useful purpose in the way of nutrition, and even in small quantities must be more or less harmful. Under the regulations made for the enforcement of the act, in Food Inspection Decision No. 76, the following statement is made:

"The law provides that no food or food product intended for interstate commerce, nor any food or food product manufactured or sold in the District of Columbia or in any territory of the United States, or for foreign commerce, except as thereinafter provided, shall contain substances which lessen the wholesomeness or which add any deleterious properties thereto. It has been determined that no drug, chemical, or harmful or deleterious dye or preservative may be used. Common salt, sugar, wood smoke, potable distilled liquors, vinegar, and condiments may be used. Pending further investigation, the use of saltpeter is allowed."

As exceptions to these sweeping provisions it is provided further:

"Pending the investigation of the conditions attending processes of manufacture, and the effects upon health, of the combinations mentioned in this paragraph, the Department of Agriculture will institute no prosecution in the case of the application of fumes of burning sulphur (sulphur dioxid), as usually employed in the manufacture of those foods and food products which contain acetaldehyde, sugars, etc., with which sulphurous acid may combine, if the total amount of sulphur dioxid in the finished product does not exceed 350 milligrams per liter in wines, or 350 milligrams per kilogram in other food products, of which not over 70 milligrams is in a free state.

"No prosecutions will be based on the manufacture, sale, or transportation of food and food products manufactured or packed during the season of 1907 which contain sodium benzoate in quantities not exceeding one-tenth of 1 per cent, or benzoic acid equivalent thereto, provided sodium benzoate or benzoic acid has hitherto been generally used in such foods and food products."

In regard to the use of colors, it is provided that, of the thousands of coal-tar dyes, only seven shall be used, as follows:

Red shades:
107. Amaranth.
56. Ponceau 3 R.
517. Erythrosin.
Orange shade:
85. Orange I.
Yellow shade:
4. Naphthol yellow S.
Green shade:
435. Light green S. F. yellowish.
Blue shade:
692. Indigo disulfoacid.

"Each of these colors shall be free from any coloring matter other than the one specified and shall not contain any contamination due to imperfect or incomplete manufacture."

The plain effect of the law and the regulations made thereunder is evident. We are approaching, rapidly in most instances and gradually in others, the complete and ideal enforcement of the act, and, when this time fully arrives, no food products of any kind will any longer contain chemical preservatives or any added coloring. When this condition is reached, there will no longer be a discussion respecting the relative harmfulness and wholesomeness of these substances which are not foods, but which have been used so extensively therein. Every consumer will be assured that the articles he purchases, both of foods and drugs, are pure and of full strength, free of any concealment of inferiority or damage by artificial coloring, and otherwise wholesome and nutritious.

The future in pure food legislation.

In the foregoing synopsis, nothing has been said respecting the state laws, which have been enacted for purposes similar to that of the national law. It is well understood that, owing to our form of government, the United States cannot enter a state and exercise any of the police functions therein which properly belong to the state. The only power which Congress has over adulterated and misbranded foods and drugs, is in the District of Columbia and the territories, in foreign commerce, and in commerce between the states.

Assuming, for the time being, that the Food and Drugs Act needs but little, if any, amendment, the first thing that we may justly hope for is that the definitions and provisions of the state acts shall be made to conform to those of the federal act. In this way, the execution of the food and drug laws in the states will be brought into entire harmony with the execution of the food and drug laws in interstate and foreign commerce. In fact, there is a very wise provision in the Food and Drugs Act which associates all state authorities in its enforcement. The food and drug officials of each state have coördinate authority with the Secretary of Agriculture in the enforcement of the act, and, in point of fact, a system of collaboration has been provided between nearly all the states of the

United States, looking to the more effective administration of this clause of the law. It is not to be expected that in the method of executing a state law, nor in the penalties which are imposed for its violation, nor necessarily in any of the mechanism of the law, should there be any attempt to conform to the provisions of the federal law. These are matters which do not relate to the principles involved, and which can be safely left for each state to handle in its own way. Each state, in fact, does do this, and many different forms of administration are found among the states. But the principal need in the future is that the legislative enactments relating to definitions of adulteration and misbranding, and other legislation of similar character pertaining to principles of the act and not to its enforcement, shall be brought into as close harmony as possible.

In the future, we may hope that any defects in the national act may be corrected by the necessary legislation. It is not to be expected in an act of this kind, although debated for so long a time, that it should be free from imperfections. It doubtless contains many of them, and these will appear from time to time as the act is enforced. Any changes in the act, however, must necessarily, if they are germane to its purpose, be in the direction of making it more effective and more stringent, and not less so. The law, doubtless, will receive amendments of this character, making it more nearly the ideal representation of the whole people respecting their desire for pure food and pure drugs. When these amendments to the national law are perfected, it is reasonable to expect that they will also be adopted by the states. The final effect in the future will doubtless be that the very widely extended system of misrepresenting the character of foods and drugs will be entirely abandoned. False statements of quality, false statements respecting the origin of the goods, false statements respecting their manufacture, false statements respecting their character and use, will be eliminated. All misleading devices and designs of trade-marks or terms will necessarily fall. The courts have already decided that the trade-mark cannot be admitted to registry if it contains anything which is a violation of the Food and Drugs Act. Hence a trade-mark can no longer register a misleading design: as, for example, a maple tree in connection with a sirup manufactured from sorghum or sugar-cane; nor a leaf on a package of lard which is not a leaf lard; nor a grape vine on a label of dilute acetic acid, made from distilled alcohol, masquerading as vinegar; and so on through the list.

After the elimination of all misleading statements respecting quality and character in the future, we shall see the entire abandonment of the addition to food products of bodies which are not foods, and which are added either as chemical preservatives or as coloring matters. This, at least, will be true for the food products which have a natural color. If colors continue to be used for products which have no natural color, they will certainly be free from any suspicion of injury to health. For example, aniline dye is known to be a poisonous body, and, hence, the use of colors made from the aniline radical must necessarily, in the future, be abandoned, since, theoretically as well as practically, it is almost impossible to produce a coloring matter without some of the poisonous principle still existing therein. In the future, when a beverage is offered, such as that of the grape, of a red color, fermented or unfermented, the consumer will know it is the natural color of the grape. If a lemonade is offered of a yellow tint, he will know that it comes from a lemon; and the amber color of his distilled liquor will come from long storage in wood, and not from added caramel, harmless as the latter may be.

Confidence will be established between the consumer and the manufacturer, instead of the suspicion which now exists. There will be a general uplift of the morality of trade, and the purpose of trade will not be the dollar solely, but also the character of the goods produced. Manufacturers will vie with each other in producing foods and drugs of the highest quality, since that will be, in the end, the kind of business which will pay the best and longest continuing dividends. There will be a general moral uplift in all trades associated with those of foods and drugs, which will be of deep benefit to the commerce of the country; and, in the end, there will be a general merchandise-marks act which will extend the principle of the misbranding and the adulterating provisions of the Food and Drugs Act to all articles of commerce.

LEGISLATION RELATING TO DAIRY PRODUCTS

By *George L. Flanders*

The legislature, of New York, in 1884, passed the first state law creating a department, known at that time as the Dairy Commission, to safeguard the interests of the consuming public against the sale of adulterated milk and of oleaginous substances, not made from milk or cream of the same, designed to take the place of butter; or, rather, the first law prohibited the manufacture and sale of the latter as a substitute for butter. (Chapter 202, Laws of 1884.) This law was declared unconstitutional. (People vs. Marx, 99, N. Y.) The legislature of 1885 amended the statute by prohibiting the manufacture or sale of oleaginous substances not manufactured from milk or cream for sale in imitation or semblance of butter, the product of the dairy. (Chapter 183 of the Laws 1885.) This law was declared constitutional by the Court of Appeals. (People vs. Arensburg, 105, N. Y., page 123.) This law was amended from time to time until 1893, when the name of the department was changed from that of Dairy Commission to Department of Agriculture. [For the amendments, see the last annual report of the Commissioner of Agriculture, which gives the number as eighty-six.] The amendments of the law also provided against the sale of imitation or adulterated cheese; provided for a brand to be supplied by the state for marking full cream cheese; and provided against falsely branding or labeling cheese as to the quality.

As to milk, the New York statute, as finally amended, provides against the sale of skimmed milk in New York and Kings counties, but provides that it may be sold elsewhere in the state under the following conditions, namely, that it may be sold in the county where produced or in the adjoining counties, provided it is sold as and for skimmed milk; that it may also be sold to factories where so-called skim cheese is manufactured.

For the purpose of illustration, the following synopsis of the provisions of Article II of the agricultural law of New York State relating to dairy products, and Section 20, defining the terms, are inserted:

Dairy Products

Section 20. Definitions.
21. Care and feed of cows.
22. Prohibition of the sale of adulterated milk.
23. Regulations in regard to butter and cheese factories.
23a. Penalty for delivery of adulterated milk.
24. Cans to be branded with name of county.
25. Regulations in regard to condensed milk.
26. Manufacture and sale of imitation butter prohibited.
27. Manufacture or mixing of animal fats with milk, cream or butter prohibited.
28. Prohibited articles not to be furnished for use.
29. Use of coloring matter prohibited.
29a.
30. Manufacture and sale of imitation cheese prohibited.
31. When prohibitions do not apply to skim milk or skim cheese.
32. Unclean receptacles and places for keeping milk; notice to violators of provisions.
32a. Unsanitary cans and receptacles condemned.
32b. Receptacles to be cleaned before return; may be seized; evidence; violation; milk-can inspectors.
33. Manufacturers' brand of cheese.
34. Use of false brand prohibited.
35. County trade-marks.
36. Object and intent of this article.

. . . .

Section 20. Definitions.—The terms, butter and cheese, when used in this article, mean the products of the dairy, usually known by those terms, which are manufactured exclusively from pure, unadulterated milk or cream or both, with or without salt or rennet, and with or without coloring matter or sage. The terms oleomargarine, butterine, imitation butter or imitation cheese, shall be construed to mean any article or substance in the semblance of butter or cheese not the usual product of the dairy, and not made exclusively of pure and unadulterated milk or cream, or any such article or substance into which any oil, lard or fat not produced from milk or cream enters as a component part, or into which melted butter or butter in any condition or state, or any oil thereof has been introduced to take the place of cream. The term, adulterated milk, when so used, means:

1. Milk containing more than eighty-eight per centum of water or fluids.
2. Milk containing less than twelve per centum of milk solids.
3. Milk containing less than three per centum of fats.
4. Milk drawn from cows within fifteen days before and five days after parturition.
5. Milk drawn from animals fed on distillery waste or any substance in a state of fermentation or putrefaction or on any unhealthy food.
6. Milk drawn from cows kept in a crowded or unhealthy condition.
7. Milk from which any part of the cream has been removed.
8. Milk which has been diluted with water or any other fluid, or to which has been added or into which has been introduced any foreign substance whatever.

All adulterated milk shall be deemed unclean, unhealthy, impure and unwholesome. The terms, pure milk or unadulterated milk, when used singly or together, mean sweet milk not adulterated, and the terms pure cream or unadulterated cream, when used singly or together mean cream taken from pure and unadulterated milk.

New York was the pioneer state in this movement. No state had passed a law and provided machinery with which to enforce it prior to the movement in the state of New York, in 1884. There had been some laws placed on the statute books, but no means had ever been provided for enforcement. They were not obeyed, and no attempt was made to enforce them. One of the southern states had passed an anti-oleomargarine law, but had not provided machinery for its enforcement. Suit was tried under that law and Roscoe Conkling, of New York, was employed to argue for the people, but was defeated. From time to time, since 1884, different states have passed laws relative to dairy products, until nearly all of them have such a law at the present time.

The milk, butter and cheese standards in the different states were as follows, in 1904. [See Table, on following page.]

The principle involved.

The principle involved in the enactments of the laws in given states relative to milk and to oleomargarine has practically been as follows:

(1) That no adulterated milk shall be sold or exposed for sale on the market.

(2) That any milk falling below a certain standard should be declared to be adulterated, on the evidence being produced that it is below that standard, without evidence as to actual adulteration. In some states, this was based on the theory that the standard should be low enough to take any pure milk that was mixed milk from a herd of healthy cows, reasonably well taken care of; that any milk poorer than this must of necessity be adulterated. So it was determined to make it a conclusive rule of evidence that milk falling below the standard was poorer in quality than pure milk, and was therefore adulterated milk. It should not be overlooked that this is a rule of evidence as to but one way of determining adulterated milk, and does not in any sense warrant the conclusion that milk up to the standard or above it is pure milk. This, however, does not seem to have been the theory entertained in the Massachusetts legislature, when enacting a stand-

STANDARDS FOR DAIRY PRODUCTS, 1904

States	Milk			Skimmed milk	Cream	Butter	Cheese
	Total solids	Solids not fat	Fat	Total solids	Fat	Fat	Fat
	Per cent	Per cent	Percent	Per cent	Percent	Per cent	
United States	12	8.5	3.25	9.25	18	82.5	Full cream, 50 per cent of the total solids to be fat.
California	. . .	. .	. .	. . .	. .	. . .	Full cream, 30 per cent fat; half skim from skimmed milk. Fancy excepted.
Colorado	. . .	. .	. .	. . .	. .	. . .	Full cream, 35 per cent total solids to be fat; skim, fat less than 35 per cent of total solids.
Dist. of Columbia	. . .	9	3.5	9.3	20	83 Not over 12 per cent water or 5 per cent salt.	
Georgia	. . .	8.5	3.5	. . .	. .	. . .	
Hawaii	11.5	. .	2.5	. . .	. .	. . .	
Idaho	. . .	8	3	. . .	18	82.5	Full cream, 30 per cent fat (fancy excepted); skim, less than 15 per cent, sale prohibited.
Illinois	. . .	. .	3	. . .	15	80	Whole milk, 48 per cent total solids to be fat.
Indiana	. . .	9	3	. . .	. .	80 Maximum water 15 per cent, salt 6 per cent.	Skim, minimum fat 10 per cent.
Iowa	12.5	. .	3	. . .	15	. . .	
Kentucky	12	. .	3	. . .	15	80	Skim, less than 10 percent fat.
Maine	12	. .	3	. . .	. .	. . .	Skim.
Maryland	12.5	. .	3.5	. . .	. .	. . .	
Massachusetts	13	9.3	3.7	9.3	. .	. . .	
April to Sept.	12	9	3	. . .	. .	. . .	
Michigan	12.5 Specific gravity 1.029–33	. .	3	. . . Specific gravity 1.032–37	. .	. . .	
Minnesota	13	. .	3.5	. . .	20	Maximum water 16 per cent.	Full cream, 45 per cent total solids to be fat; skim, fat less than 45 per cent of total solids.
Missouri	. . .	. .	. .	. . .	. .	. . .	Full cream, from milk with 3 per cent fat; skim, from milk less than 3 per cent fat.
Montana	12	9	3	9 Solids not fat	15	. . .	
Nebraska	. . .	. .	3	. . .	15	. . .	
New Hampshire	13	9.5	3.5	9	. .	. . .	
April to Sept.	12	. .	3	. . .	. .	. . .	
New Jersey	12	. .	. .	. . .	. .	. . .	
New York	12	. .	3	. . .	. .	. . .	Skim from skimmed milk.
North Carolina	12	8.5	3.25	. . .	18	82.5	Full cream, 50 per cent total solids to be fat; skim, from skimmed milk; cream cheese, milk 6 per cent minimum fat.
North Dakota	12	. .	3	. . .	15	. . .	Skim, from skimmed milk.
Ohio	12	. .	3	. . .	. .	80	Full cream, 30 per cent fat; skim, less than 30 per cent fat.
Oregon	12	9	3	9	20	Not over 14 per cent water	Full cream, 30 per cent fat; half skim, 15 to 30 per cent; quarter skim, 7½ to 15 per cent; skim, less than 7½ per cent. Fancy excepted.

STANDARDS FOR DAIRY PRODUCTS, 1904, continued

States	Milk			Skimmed milk	Cream	Butter	Cheese
	Total solids	Solids not fat	Fat	Total solids	Fat	Fat	Fat
	Per cent	Per cent	Percent	Per cent	Percent	Per cent	
Pennsylvania . .	12	. .	3	8	. .	. . .	Full cream, 32 per cent fat; three-fourths cream, 24 per cent fat; one-half cream, 16 per cent fat; one-fourth cream, 8 per cent fat; skim, below 8 per cent fat. Fancy, less than 5 lbs., excepted.
Porto Rico . . .	12	. .	3	. . .	. .	80 Maximum water 16 per cent; salt 6 per cent	Full cream, 30 per cent fat; one-half skim, 15 per cent fat; skim, 10 per cent fat.
Rhode Island . .	12	. .	2.5	. . .	. .	. . .	
South Carolina .	. . .	8.5	3	. . .	. .	. . .	
South Dakota . .	13	. .	3	. . .	20	80	Full cream, 45 per cent solids to be fat; skim, less than 45 per cent fat.
Utah	12.5	. .	3	9 Solids not fat	20	83	Skim, 7 to 11 inches in diameter; minimum height 9 inches.
Vermont . . .	12.5	9.25	. .	. . .	. .	. . .	
May and June .	12	. .	. .	. . .	. .	. . .	
Washington . .	. . .	8	3	. . .	18	. . .	Full cream, 30 per cent fat; skim, 15 per cent fat. Fancy excepted.
Wisconsin . . .	. . .	. .	3	. . .	. .	. . .	Skim, 10 inches in diameter, 9 inches in height.
Wyoming . . .	12	. .	2.4	. . .	. .	80	Skim, less than 20 per cent fat.

ard in that state. Their standard is higher (see table) and their theory was that the consumer should be entitled to milk as good as the average milk. The theory of those who created the standards, to let in the poorest quality of pure milk, was that a man had the right to sell milk that was pure just as it came from the cows, irrespective of quality, that milk better than the poorest quality would have to compete on its merits with other milk sold on the market. It will readily be seen that if the standard were fixed as high as the average milk of the state, one-half of the milk in the state would continuously be below the standard. These milk laws with standards have been continuously upheld by the courts as a proper exercise of the police power of the state. (People vs. Cipperly 37 Hun. as a New York case. This case was affirmed by the Court of Appeals. Similar decisions have been rendered in other states.)

The following principle, involved in the milk law, has been sustained in the United States Supreme Court in the case of the People of the State of New York vs. St. John. The case was in Buffalo, where the defendant was selling milk below the standard. He was convicted, and the case was appealed. It was taken to the Supreme Court of the United States, on the ground that the law of the State of New York discriminated in that no action could be brought against a man who was selling milk as good as the milk from his cows, but that an action could be brought against another man for selling the same milk, it being below the standard set by the State. The court, however, held that this was an exercise of the police power, and that there were two different methods of proceeding against the two different men provided in the statute, and that it was within the power of the legislature to provide a separate method, one being by prosecution and the other by injunction.

The principle involved in the oleomargarine acts of the different states, as a rule, has been that the goods should not be allowed to be sold in imitation or semblance of butter, the product of the dairy. These statutes have not all been worded alike. For example, Massachusetts forbids the sale in imitation or semblance of yellow butter, the product of the dairy. The New York statute, among others, forbids the sale in imitation or semblance of butter, the product of the dairy. These statutes in the different states have been upheld by the courts of last resort as a proper exercise of the police power of the state. Two leading examples are the case of Plumely vs. Commonwealth of Massachusetts (155 United States 461) in which the Supreme Court of the United States held that a state law prohibiting the sale of goods in imitation or semblance of butter the product of the dairy, was constitutional, it being within the power of the state, under the police powers, to prohibit the sale of counterfeit; and the case entitled Scolenberger vs. Pennsylvania (171 United States 29), in which the Supreme Court of the United States held that the law of Pennsylvania was unconstitutional as to the package under consideration. These two cases were thought by some to be in conflict, but they were not. The distinction in the two was as follows: In the Massachusetts case, the oleomargarine was in an original importer's package, and was carried into the state of Pennsylvania from some other state, and was colored in imitation of butter. These facts were placed before the court at the trial. In the Scolenberger case, the same set of facts were true except that it did not appear in the evidence that the goods were colored in imitation or semblance of butter, so in that case they lacked the one element that was in the Plumeley case, and that lacking element made the difference. In other words, evidence before the court in the Scolenberger case was that it was oleomargarine in the original importer's package, and the Supreme Court of the United States decided that the state law that sought to exclude it was a law attempting to regulate commerce between the states, and was not a law exercising a police power.

There is one other principle that should be considered. An attempt was made by the manufacturers of oleomargarine to sell their goods in original packages in states other than the state in which they were manufactured, relying on the fact that the power to regulate commerce between the states was granted to the National Government, and that any attempt to regulate this traffic on the part of the state would consequently be void. In 1902, United States Congress passed a bill providing for a tax of ten cents on oleomargarine so manufactured that artificial coloration was produced, and also provided that when oleomargarine was imported into the state it immediately became subject to the laws of the state to the same extent and in the same manner as though manufactured within the state, and should not be exempt by virtue of the fact that the goods were in original importer's packages. This law was attacked by the oleomargarine people on the ground that the second provision of the statute was a virtual delegating by Congress to the states of a power constitutionally placed in the hands of Congress only. The court held that this was not the delegating of a power, but was a proper exercise of it, and that the law was therefore constitutional. [See case in re Rahrer, 140 U. S. Sup. Pt., 545.]

It will be seen by the decisions in the above cases that the power to regulate the sale of dairy products under the police power of the state has been sustained by the courts in general, and that that power should be invoked in handling these questions. There is a distinction between the police power which is inherent within the state to protect the lives, morals and property of the people, and a law protecting a man against action that simply defrauds him of property; and this distinction must be kept clearly in mind in applying the laws to any given case.

GOVERNMENT SERVICE TO THE DAIRY INDUSTRY IN CANADA

By *J. A. Ruddick*

In order to understand the relation of the governments of Canada to the dairy industry, it is necessary to take cognizance of the political organization of the country, and the relative powers or functions of the federal and provincial administrations.

The Federal or Dominion Government may be said to be constitutionally responsible for all matters relating to adulteration, imitation, transportation and export of dairy produce. It also undertakes experimental, illustrative, or any special work for the benefit or improvement of the industry, particularly along commercial lines.

The several provincial governments are expected to attend to work of a purely educational character, such as the maintenance of dairy schools and the employment of expert instructors, who visit the factories and farms during the summer months. Questions relating to the sanitation of dairies, cheese factories and creameries, also come under the purview of provincial authority. The municipalities have certain powers under provincial public-health acts, by means of which they may regulate the sanitary conditions in dairies, and deal with matters affecting the production and distribution of milk for direct consumption.

Dominion laws relating to the dairy industry.

The following extracts from the Inspection and Sale Act (Revised Statutes of Canada, 1906, Chap. 85, Part VIII) will serve to indicate the scope and intention of the federal laws which affect or deal with the dairy industry in Canada.

CHAPTER 85

An Act respecting the Inspection and Sale of certain Staple Commodities

SHORT TITLE

1. This act may be cited as the Inspection and Sale Act. R. S., c. 99, s. 1.

. . . .

PART VIII

DAIRY PRODUCTS

Interpretation.

279. In this Part, unless the context otherwise requires,—

(*a*) 'creamery' means a place where the milk or cream of not less than fifty cows is manufactured into butter;

(*b*) 'dairy' means a place where the milk or cream of less than fifty cows is manufactured into butter in a building equipped with proper appliances;

(*c*) 'butter' means the food product commonly known as butter, which is manufactured exclusively from milk or cream or both, with or without the addition of coloring matter, common salt, or other harmless preservative;

(*d*) 'creamery butter' means butter which is manufactured in a creamery;

(*e*) dairy butter' means butter which is manufactured in a dairy;

(*f*) 'renovated butter' or 'process butter' means any butter which has been melted, clarified or refined, and made to resemble butter. 3 E. VII., c. 6, s. 2.

Registration.

280. The Minister of Agriculture shall keep in the Department of Agriculture a book to be called the Cheese Factories and Creameries Register, and any person engaged in the business of cheese or of butter making may apply to the Department of Agriculture, at Ottawa, for the registration of the cheese factory or creamery owned or duly represented by him.

2. On receipt of the particulars as set forth in schedule A to this act, the Minister of Agriculture, or such officer of the Department of Agriculture as is designated by the Governor in Council, shall forthwith send to the owner or representative of such cheese factory or creamery a certificate showing the registration number alloted to such cheese factory or creamery. 60-61 V., c. 21, s. 2.

281. The person to whom such registration number is assigned shall thereafter have the exclusive right to use it for the purpose of designating the dairy products manufactured by him at such cheese factory or creamery, in the manner shown in schedule B to this Act. 60-61 V., c. 21, s. 3.

Marking dairy products.

282. No person shall,—

(*a*) sell, offer, expose, or have in his possession for sale, any butter or cheese made in Canada, and destined for export therefrom, unless the word ***Canadian***, ***Canadien***, or ***Canada*** is printed, stamped or marked in a legible and indelible manner, in letters not less than three-eighths of an inch high and one-quarter of an inch wide, upon the cheese itself before it is taken from the factory where it was made, and upon the box or package containing such butter or cheese;

(*b*) with intent to misrepresent, remove or in any way efface, obliterate or alter the word ***Canadian***, ***Canadien*** or ***Canada***, or the registration number on any cheese, or on any box or package which contains cheese or butter;

(*c*) apply any brand, stamp or mark of the word ***Canadian***, ***Canadien*** or ***Canada*** as a descriptive term, mark or brand, upon any cheese or upon any box or package which contains cheese or butter, unless such cheese or butter has been produced in Canada;

(*d*) knowingly sell, offer, expose or have in his possession for sale, any cheese or butter upon which or upon any box or package which contains the same, the word ***Canadian***, ***Canadien*** or ***Canada*** is applied as a descriptive term, mark or brand, unless such cheese or butter has been produced in Canada;

(*e*) sell, offer, expose or have in his possession for sale, any cheese or butter which is produced in any foreign country, unless the name of the country where such cheese or butter was produced, is branded, stamped or marked in a legible manner upon the outside of every box or package which contains the same, in letters not less than three-eighths of an inch high and one-quarter of an inch wide;

(*f*) knowingly sell, or offer, expose, or have in his possession for sale, any cheese or butter upon which, or upon any box or package containing which, is printed, stamped or marked any month other than the month in which such butter or cheese was made;

(*g*) knowingly and with intent to misrepresent, sell, or offer, expose or have in his possession for sale, any cheese or butter represented in any manner as having been made in any month other than the month in which it was actually made;

(*h*) sell, offer, expose or have in his possession for sale, any cheese manufactured from or by the use of milk commonly known as skimmed milk, or milk from which cream has been removed, or milk to which skimmed milk has been added, unless the words ***Skim-milk cheese*** are branded, marked or stamped in a legible manner upon the side of every cheese, and also upon the outside of every box or package which contains the same, in letters not less than three-quarters of an inch high and three-quarters of an inch wide;

(*i*) with intent to misrepresent or to defraud, remove or in any way efface, obliterate or alter the words ***Skim-milk cheese*** on such cheese, or on any box or package which contains the same. 56 V., c. 37, ss. 3, 4 and 5; 60-61 V., c. 21, ss. 4, 5 and 6.

Imitation cheese.

283. No person shall manufacture, or shall knowingly buy, sell, offer, expose or have in his possession for sale, any cheese manufactured from or by the use of skimmed milk, to which there has been added any fat which is foreign to such milk. 56 V., c. 37, s. 2.

283A. No person shall,—

(*a*) incorporate in a new cheese, during the process of its manufacture, any inferior curd or cheese;

(*b*) knowingly sell, expose, or have in his possession for sale, without giving due notice thereof, any cheese in which has been incorporated, during the process of its manufacture, any inferior curd or cheese;

(*c*) place in a cheese during the process of its manufacture, or at any time thereafter, any foreign substance not necessary to the manufacture of cheese.

Milk.

284. No person shall sell, supply or send to any cheese or butter or condensed milk manufactory, or to the owner or manager thereof, or to any maker of butter, cheese or condensed milk, to be manufactured, milk diluted with water, or in any way adulterated, or milk from which any cream has been taken, or milk commonly known as skimmed milk. 52 V., c. 43, s. 1.

285. No person who supplies, sends, sells or brings to any cheese or butter or condensed milk manufactory, or to the owner or manager thereof, or to the maker of cheese or butter or condensed milk, any milk to be manufactured into butter or cheese or condensed milk, shall keep back any portion of that part of the milk known as strippings. 52 V., c. 43, s. 2.

286. No person shall knowingly sell, supply, bring or send to a cheese or butter or condensed milk manufacfactory, or to the owner or manager thereof, any milk that is tainted or partly sour. 52 V., c. 43, s. 3.

[Sections 287 to 297 of the original act have been repealed.]

298. No person shall manufacture, import into Canada, or offer, sell or have in his possession for sale, any oleomargarine, butterine, or other substitute for butter, manufactured wholly or in part from any fat other than that of milk or cream. 3 E. VII., c. 6, s. 5.

299. No person shall mix with butter any acid, alkali, chemical or any substance whatever, which is introduced or used for the purpose or with the effect of causing the butter to absorb water or any part of milk or cream; or manufacture, import into Canada, or offer, sell, expose or have in his possession for sale any such mixed butter, any renovated butter or process butter. 3 E. VII., c. 6, ss. 4 and 6.

300. No person shall manufacture or import into Canada, or offer, sell or have in his possession for sale any butter containing over sixteen per centum of water. 3 E. VII., c. 6, s. 3.

301. Except as to butter in rolls, prints, or packages of less than twenty-five pounds in weight, not intended for export, and manufactured in a building equipped with the appliances used in creameries, no person shall brand or mark the word ***Creamery***, or any combination of

words which include the word *Creamery*, upon any box, package or wrapper containing butter, unless the butter contained in the box, package or wrapper consists wholly of creamery butter manufactured at one place. 3 E. VII., c. 6, ss. 7 and 9.

302. Except as to butter in rolls, prints or packages of less than twenty-five pounds in weight, not intended for export, and manufactured in a building equipped with the appliances used in creameries, no person shall sell or offer, expose or have in his possession for sale, any butter contained in any box, package or wrapper upon which the word *Creamery*, or any combination of words which includes the word *Creamery*, is branded or marked, unless the butter contained in the box, package or wrapper consists wholly of creamery butter manufactured at one place. 3 E. VII., c. 6, ss. 8 and 9.

Examination.

303. Any person charged with the enforcement of this Part may enter the premises of any person suspected of violating the provisions of this Part and make an examination of cheese or butter therein; and may enter any premises to make examination of stock or packages of butter or any substitute therefor and the marking thereof, whether such stock or packages are on the premises of the manufacturer or owner, or on other premises, or in the possession of a railway or steamship company. 56 V., c. 37, s. 9; 3 E. VII., c. 6, s. 11.

Offences and penalties.

304. (*a*) Every person who by himself or through the agency of any other person manufactures, buys, sells, exposes or has in his possession for sale, any cheese manufactured from or by the use of skimmed milk to which there has been added any fat which is foreign to such milk; and,

(*b*) Every person who obstructs or refuses to permit the lawful examination of cheese or butter, or of stock or packages or the marking thereof, as provided by this Part;

shall for each offence, upon summary conviction, be liable to a penalty not exceeding five hundred dollars and not less than twenty-five dollars, together with the costs of prosecution, and in default of payment of such penalty and costs, shall be liable to imprisonment with or without hard labor for a term not exceeding six months, unless such penalty and costs and the costs of enforcing the same are sooner paid. 56 V., c. 37, ss. 2 and 9; 3 E. VII., c. 6, s. 11.

305. Every person who sells, supplies or sends to any cheese, butter or condensed milk manufactory or to the owner or manager thereof or to any maker of cheese, butter or condensed milk, to be manufactured,—

(*a*) any milk diluted with water or in any way adulterated; or,
(*b*) milk from which any cream has been taken; or,
(*c*) milk commonly known as skimmed milk; or,
(*d*) milk from which the strippings have been taken or kept back; or,
(*e*) milk that is tainted or partly sour; or,
(*f*) milk taken or drawn from a cow known by him to be diseased;

shall, for each offence, upon summary conviction, be liable to a penalty not exceeding fifty dollars and not less than five dollars, together with the costs of prosecution, and in default of payment of such penalty and costs shall be liable to imprisonment, with or without hard labor, for a term not exceeding six months, unless such penalty and costs and the costs of enforcing the same are sooner paid.

2. Any person accused of an offence under this section and the husband or wife of such person shall be competent and compellable to testify. 52 V., c. 43, ss. 1, 2, 3, 4, 5 and 10.

306. Every person who by himself or through the agency of any other person,—

(*a*) applies any brand, stamp or mark of the word *Canadian*, *Canadien* or *Canada*, as a descriptive term, mark or brand, upon any cheese, or upon any box or package containing cheese or butter, not made in Canada; or,

(*b*) with intent to misrepresent, removes, effaces, obliterates or alters the said words or any of them, or the registration number on any cheese, or on any box or package containing cheese or butter;

shall for each offence, upon summary conviction, be liable to a penalty not exceeding twenty dollars and not less than five dollars for each cheese or box or package of cheese or butter so marked or altered as aforesaid, together with the costs of prosecution, and in default of payment of such penalty and costs, shall be liable to imprisonment, with or without hard labor, for a term not exceeding three months, unless such penalty and costs and the costs of enforcing the same are sooner paid. 56 V., c. 37, s. 4; 60-61 V., c. 21, ss. 5 and 7.

307. Every person who by himself or through the agency of any other person, knowingly and with intent to misrepresent, sells, offers, exposes or has in his possession for sale any cheese or butter represented in any manner as having been made in any month other than the month in which it was actually made, and every person who by himself or through the agency of any other person sells, offers, exposes or has in his possession for sale any cheese or butter,—

(*a*) not made in Canada which is in any way marked or branded as Canadian; or,
(*b*) made in Canada for export which is not marked or branded as Canadian; or,
(*c*) upon which is marked or branded any month other than the month in which it was made;

shall, for each offence, upon summary conviction, be liable to a penalty not exceeding twenty dollars and not less than five dollars for each cheese or box or package of cheese or butter sold, offered, exposed or had in possession for sale in violation of the provisions of this Part, together with the costs of prosecution, and in default of payment of such penalty and costs, shall be liable to imprisonment, with or without hard labor, for a term not exceeding three months, unless such penalty and costs and the costs of enforcing the same are sooner paid. 56 V., c. 37, s. 4; 60-61 V., c. 21, ss. 4, 6 and 7.

308. Every person who by himself or through the agency of any other person sells, offers, exposes or has in his possession for sale,—

(*a*) any foreign cheese or butter not marked with the name of the country in which it was made, as by this Part required; or,
(*b*) any skim-milk cheese not marked as such, as by this Part required;

or who with intent to misrepresent or to defraud, removes, effaces, obliterates or alters the words *Skim-milk cheese* on any such cheese or on any box or package containing the same, shall, for each offence, upon summary conviction, be liable to a penalty not exceeding five dollars and not less than two dollars for every such cheese or box or package of cheese or butter together with the costs of prosecution, and in default of payment of such penalty and costs, shall be liable to imprisonment, with of without hard labor, for a term not exceeding three months, unless such penalty and costs and the costs or enforcing the same are sooner paid. 56 V., c. 37, ss. 3 and 5.

309. Every person who by himself or through the agency of any other person, in contravention of the provisions of this Part,—

(*a*) manufactures, imports into Canada, sells or offers for sale, or has in his possession for sale, any oleomargarine, butterine, or other substitute for butter, manufactured wholly or in part from any fat other than that of milk or cream; or,

(*b*) mixes with butter any acid, alkali, chemical, or any substance whatever which is introduced or used for the purpose or with the effect of causing the butter to absorb water or any part of milk or cream; or,

(*c*) manufactures, imports into Canada, sells or offers for sale, exposes or has in his possession for sale, any butter mixed as aforesaid, or any renovated butter or process butter;

shall for each offence, be liable to a penalty not exceeding four hundred dollars and not less than two hundred dollars, together with the costs of prosecution, and in default of payment of such penalty and costs, shall be liable to imprisonment, with or without hard labor, for a term not exceeding three months, unless such penalty and costs and the costs of enforcing the same are sooner paid. R.S., c. 100, s. 1; 3 E. VII., c. 6, s. 10.

310. Every person who, by himself or through the agency of any other person, in contravention of the provisions of this Part, -

(*a*) manufactures or imports into Canada, sells or offers for sale, or has in his possession for sale, any butter containing over sixteen per centum of water; or,

(*b*) brands or marks the word *Creamery* or any combination of words which includes the word *Creamery*, upon any box, package or wrapper containing butter, unless the butter contained in the box, package or wrapper consists wholly of creamery butter manufactured at one place; or,

(*c*) sells or offers for sale, exposes or has in his possession for sale, any butter contained in any box, package or wrapper upon which the word *Creamery* or any combination of words which includes the word *Creamery* is branded or marked, unless the butter contained in the box, package or wrapper consists wholly of creamery butter manufactured at one place;

shall, for each offence, be liable to a penalty not exceeding fifty dollars and not less than ten dollars, together with the costs of prosecution, and in default of payment of such penalty and costs, shall be liable to imprisonment, with or without hard labor, for a term not exceeding three months, unless such penalty and costs and the costs of enforcing the same are sooner paid. 3 E. VII., c. 6, s. 10.

[Section 311 has been repealed.]

312. The person on whose behalf any milk is sold, sent, supplied or brought to a cheese or butter or condensed milk manufactory for any of the purposes aforesaid, shall be *prima facie* liable for the violation of any of the foregoing provisions of this Part. 52 V., c. 43, s. 6.

313. The person on whose behalf any cheese or butter is manufactured, sold, offered, exposed or had in possession for sale contrary to the provisions of any of the foregoing sections of this Part, shall be *prima facie* liable for the violation of any of the said provisions. 56 V., c. 37, s. 6.

The laws, as hereinbefore quoted, are administered by the Dairy and Cold Storage Commissioner and his staff, under the direction of the Minister of Agriculture.

Other service rendered by the Dairy and Cold Storage Commissioner.

Some of the most effective work done by the Dairy and Cold Storage Commissioner for the benefit of the dairy industry of the Dominion is without the sanction or authority of any law or regulation. For instance, arrangements are made with the various railway companies to operate a service of iced cars for the carriage of butter and cheese from the dairy districts to Montreal and other points of export. The butter cars are run regularly over stated routes, picking up shipments of butter in any quantity at regular tariff rates. The government guarantees two-thirds of the earnings of the cars from starting-point to destination, and pays four dollars per car for icing The cheese cars are provided by the railways on demand of shippers for shipment of cheese in car-loads at current tariff rates, and the government pays icing charges to the extent of five dollars per car, on a limited number of cars per week for ten weeks during the hot weather.

Several men are employed as inspectors of the iced-car services. Some of them travel over the routes with the cars and report on the manner in which the produce is handled, take temperatures of butter as delivered at the stations, and test the packages again on arrival at destination. It is their business to see that the cars are kept clean and that they are properly iced. A staff of inspectors is employed at Montreal, who note the time of arrival of the iced cars from the country and report on the condition of the cars and their contents. Inspectors are on duty at the wharves while perishable produce, including butter and cheese, is being loaded into the steamers, and their reports furnish information on the following points: Name of steamer, destination, sailing date, particulars of ventilation of holds, number and condition of refrigerating chambers, number of cooled air-chambers, quantities and kinds of produce carried in these chambers, comments on the handling of the cargo, number of thermographs placed in the ship and with what cargo placed, &c., &c. Although these cargo inspectors have no legal status, their work is now performed with the sanction and approval of the steamship companies, who recognize that, in the long run, it is for the good of their business, as well as good for the trade in perishable produce. If an inspector finds a longshoreman handling perishable produce roughly and reports him to the superintendent, the latter will usually discharge him, unless there is an immediate and lasting improvement in his manner of working. In this respect, alone, the oversight exercised by the inspectors has been productive of incalculable benefit both to shippers and carriers of perishable goods. The very fact that the men who work on the docks know that there is an inspector around tends to make them careful.

Inspection in Great Britain.

A staff of five cargo inspectors is maintained in Great Britain, covering the ports of Bristol, Glasgow, Liverpool, London and Manchester. These men are on hand while Canadian cargoes are being discharged, and they report on the condition of the different products. They also test the temperatures of the marked packages of butter, and remove the thermograph records, which they mail at once to headquarters at Ottawa.

Thermograph records.

It is part of the Montreal cargo inspectors' duty to place locked-up thermographs in every cold-storage chamber, or any other part of a ship in which produce is stowed. These records are removed by the inspectors in Great Britain as already mentioned, while the instrument remains in the ship. Photographic copies are made of the thermograph records and one of these is filed in the Exchange Room at the Montreal Board of Trade, another is sent to the Montreal agents of the shipping company, and further copies may be had by any interested shipper.

Creamery cold-storage bonus.

The Dominion government pays a bonus of one hundred dollars to any creamery for the erection of a cold-storage chamber, constructed and equipped according to plans and specifications furnished gratis by the Dairy and Cold Storage Commissioner. The bonus is not paid until the end of at least one season's operation, and the creamery cold-storage inspector has made a favorable report on it.

Provincial assistance to the dairy industry.

The legislatures of all the provinces of Canada have enacted laws to provide for a cheap and simple form of incorporation for coöperative or joint-stock associations for the manufacture of butter and cheese.

Ontario.—The province of Ontario has always been considered the leading dairying district of the Dominion. The factory system first came into prominence in this province in the sixties. The first attempt at organization of the industry resulted in the formation of the Canadian Dairymen's Association in 1867, which after about ten years' existence was divided into the Dairymen's Association of Western Ontario and the Dairymen's Association of Eastern Ontario, respectively. Later, the Ontario Creameries Association was formed, but it was shortly merged into the other two associations. These associations have received annual grants of money from the Ontario Legislature, out of which they have paid the expenses of an annual convention, and for some time they paid for the services of traveling instructors. The system of employing traveling instructors was instituted in Ontario in 1881, and has been continued ever since, with various changes and modifications from time to time. At the inception of the scheme, the instructors were paid and controlled wholly by the Dairymen's Associations. As the demand for instruction increased and the expense of the work got beyond the resources of the associations, the factories receiving the assistance were required to pay certain fees, which were applied to the salaries of the instructors.

The government of the province began to assume more direct control about the year 1900, and at the present writing (1908) the system of instruction and inspection which covers every cheese factory and creamery in the province is under the direct control of the provincial department of agriculture. There are thirty-three inspector-instructors and two chief instructors, all working under the Director of Dairying, who is an official attached to the Department of Agriculture at Toronto. The Dairymen's Associations still act in an advisory capacity with the Minister of Agriculture.

Dairy schools.—The province of Ontario maintains two dairy schools, one at Guelph, as a department of the Ontario Agricultural College, and an independent one at Kingston. Tuition is free at these schools. Practical courses are arranged for the winter months, which are attended chiefly by experienced cheese- and butter-makers.

Ontario laws.—The inspector-instructors employed by the Ontario government have the force of law behind them, and may compel owners of factories to take the necessary steps to secure sanitary conditions in and around the buildings. The law is as follows:

THE MILK, CHEESE AND BUTTER ACT

(*Assented to April* 14, 1908.)

His Majesty, by and with the advice and consent of the Legislative Assembly of the Province of Ontario, enacts as follows:

Standard of Milk in Creameries

1. This Act may be cited as the ***Milk, Cheese and Butter Act.***

2. All milk containing less than thirteen per cent of total solids, of which three and three-quarters per cent must be chemically dry butter-fat, shall be deemed below the standard required in creameries for butter manufacture. R.S.O. 1897, c. 251, s. 1.

3. The owners or board of management of any creamery in the Province of Ontario, may make such rules and regulations as may be advisable for the due carrying on of the business of the creamery. R S. O. 1897, c. 251, s. 2.

4. The patrons of all creameries may be required to subscribe their names to such rules and regulations, and the rules and regulations shall be binding on the patrons, owners and board of management who have so subscribed. R.S.O. 1897, c. 251, s. 3.

Prevention of Frauds

5. It shall be lawful for the owner or manager of a cheese or butter manufactory to require the owner or custodian of any cow or cows whose milk is being bought for, or supplied or sent to, the manufactory, to submit such cow or cows at his farm or other premises where such cows are usually kept, to such milk test, by persons named by such owner or manager, as may be necessary for the said persons to ascertain the quantity and quality of the milk of such cow or cows, on any day, and at such time on any such day as may be appointed by said owner or manager, and in case the owner or custodian of the cows refuses to so submit them, or obstructs in the execution thereof the persons engaged in making the milk test, or interrupts the test, or interferes in any way with the test, or the application of its result, he shall, on complaint before any Justice or Justices of the Peace, forfeit

and pay for every such offence a sum of not less than $10 nor more than $100, in the discretion of the Justice or Justices of the Peace who may hear such complaint, together with the costs of the prosecution, if so ordered, and in default of payment of the penalty and costs, shall be liable to be committed by the convicting Justice or Justices of the Peace, to the common gaol of the county, with hard labour for any period not exceeding six months or until said penalty and the costs of enforcing same are sooner paid. R.S.O. 1897, c. 251, s. 4.

6. It shall be lawful for the owner or manager of any cheese or butter manufactory who suspects any person of selling, supplying, sending or bringing milk to the manufactory, of any offence under this Act, to enter upon or to appoint some person or persons to enter upon, and such appointed person may enter upon the premises of the suspected person with or without notice, and take samples of milk from the cow or cows from which the supposed offender was or had been immediately before then procuring the milk or part of the milk so sold, supplied, sent or brought as aforesaid; and any such suspected person who obstructs or refuses to permit the taking of any such sample shall, on conviction thereof be liable to a penalty of not less than $10 nor more than $50 with costs of the prosecution, and in default of payment thereof, shall be liable to be imprisoned in the common gaol of the county in which the offence has been committed for a period not exceeding three months with hard labour. R.S.O. 1897, c. 251, s. 5.

7. No person shall sell or offer for sale in any city, town or incorporated village, and no person shall sell or supply under contract to any person in any city, town or incorporated village, and no person shall sell, supply, bring or send to a cheese or butter manufactory, or the owner or manager thereof, milk diluted with water, or in any way adulterated, or milk from which any cream has been taken, or milk commonly known as "skimmed milk" or milk in which any preservative is contained, without distinctly notifying, in writing, the owner or manager of such cheese or butter manufactory, or the person or persons to whom it is sold in cities, towns, or incorporated villages, that the milk so sold, supplied or brought to be manufactured or otherwise disposed of, has been so diluted with water, or adulterated, or had the cream so taken from it, or become milk commonly known as "skimmed milk," or has had a preservative added to it, as the case may be. R.S.O. 1897, c. 251, s. 6, *amended.*

8. No person who, in the course of his business, agrees to sell, supply, bring or send to any cheese or butter manufactory, or the owner or manager thereof, to be manufactured, the milk of any cow or cows, shall, in the course of such dealing and business, keep back any part of the milk of such cow or cows without distinctly notifying, in writing, the owner or manager of such cheese or butter manufactory what portion of the milk he has so kept back. R.S.O. 1897, c. 251, s. 7.

9. Notwithstanding anything contained in this Act, no person shall be subject to any penalties under this Act for selling in any city, town or incorporated village milk from which any of the butter, fat or cream has been removed, provided the milk so sold or offered for sale is advertised as "skimmed milk" and the person to whom the milk is sold is informed that the same is "skimmed milk." (*New.*)

10. No person shall sell, supply, bring or send to a cheese or butter manufactory, or owner or manager thereof, to be manufactured, any milk that is tainted or partly sour without distinctly notifying, in writing, the owner or manager of such cheese or butter manufactory of such milk being tainted or partly sour. R.S.O. 1897, c. 251, s. 8.

11. No person supplying milk or cream to a cheese factory or creamery, or for sale in cities, towns or incorporated villages, shall keep his dairy, milk house, milk stand or any vessels or equipment used for the storing or the carrying of milk or cream, in an unclean or unsanitary condition. 6 Edw. VII. c. 48, s. 1, *amended.*

12.—(1). Every cheese factory and creamery manufacturing butter or cheese for public use or sale, and the premises upon which milk or cream is offered for sale and the surroundings of every such cheese factory and creamery and premises shall be kept in a clean and sanitary condition, and all the water used therein for the manufacture of any dairy products must be clean and pure.

(2) The owner or manager of any cheese factory or creamery or premises upon which milk or cream is offered for sale, refusing or neglecting to observe the provisions of this section after being warned or advised by a dairy inspector, shall, upon conviction thereof before any Justice or Justices of the Peace, forfeit and pay a sum of not less than $50 nor more than $200, together with the costs of prosecution, and in default of payment of such penalty and costs shall be liable to be committed to the common gaol of the county with hard labour for a period not exceeding six months. 6 Edw. VII., c. 48, ss. 2 and 3, *amended.*

13. Upon the recommendation of the Minister of Agriculture, the Lieutenant-Governor in Council may appoint one or more persons as inspectors for the enforcing of the provisions of this Act, who shall be known as Dairy Inspectors. The Lieutenant-Governor in Council may determine the remuneration to be paid to such inspectors. 6 Edw. VII., c. 48, s. 4.

14. All dairy inspectors appointed under this Act shall have free access and admission to all cheese factories and creameries and the premises upon which milk or cream is offered for sale located within the Province and to all the lands adjoining the same, and to the premises of all persons supplying milk or cream to any cheese factory or creamery, or for sale in cities, towns or incorporated villages; they shall also be empowered to take and test samples of milk found in cheese factories or creameries or in the possession of milk dealers having the same for sale in cities, towns or incorporated villages, or in transit between producers and cheese factories and creameries, between producers and dealers, or between dealers and consumers in cities, towns or incorporated villages; and they shall have the right to take and test samples of milk found upon the premises of producers supplying milk to cheese factories or creameries or for sale in cities, towns or incorporated villages, and may take and test samples from cows which have been producing milk to be sold to cheese factories or creameries or to be delivered for sale in cities, towns or incorporated villages, and any person refusing admission to the same or offering obstruction to the work of inspection or the taking of samples or testing of same shall be subject to the penalties provided in section 15. 6 Edw. VII., c. 48, s. 5, *amended.*

15. Every inspector appointed under this Act shall make such reports and in such form as the Minister may direct. 6 Edw. VII., c. 48, s. 6.

16.—(1) Any person who, by himself, or by his servant or agent, violates any of the provisions of sections 7, 8, 10 or 14 of this Act, upon conviction thereof before any Justice or Justices of the Peace, shall forfeit and pay a sum of not less than $5 nor more than $50, together with the costs of prosecution, in the discretion of the Justice or Justices, and in default of payment of such penalty and costs, shall be liable to be committed to the common gaol of the county, with hard labor, for any period not exceeding six months, unless the said penalty and the costs of enforcing same are sooner paid

(2) For the purpose of establishing the guilt of any person under the said sections, 7 or 8 of this Act, it shall be sufficient *prima facie* evidence to show that such person, by himself, his servant, or agent, sold, sup-

plied, sent or brought, to be manufactured, to any cheese or butter manufactory, milk substantially below the standard of that actually drawn, or by the accused represented as having been drawn from the same cow or cows within the then previous or subsequent two weeks, provided the comparison or test is made by means of a lactometer and Babcock Tester, or by some other adequate means of making the comparison.

(3) The said sections 7, 8 and 10, shall not apply where the person charged with the offence proves to the satisfaction of the Justice or Justices of the Peace that the alleged offence was committed by some person or persons other than a member of the family of the person charged with the offence or was committed by some person or persons other than his servant or agent, and also that the offence was committed without his knowledge and consent. (*New.*)

(4) In any complaint made or laid under said sections, 7, 8, 10 or 14 of this Act, and in any conviction thereon, the milk complained of may be described as deteriorated milk, without specification of the cause or mode of deterioration, and such description shall be a sufficient description of the offence to sustain a conviction, and in any complaint, information or conviction under this Act the matter complained of may be declared, and shall be held to have arisen within the meaning of *The Ontario Summary Convictions Act*, at the place where the milk complained of was to be manufactured, notwithstanding that the deterioration thereof was effected elsewhere. R.S.O. 1897, c. 251, s. 9, *amended.*

17. Any pecuniary penalty imposed by the preceding section in respect of selling, supplying or bringing milk to a cheese or butter manufactory, shall, when recovered, be payable one-half to the informant, and the other one-half to the owner, treasurer or president of the manufactory to which the milk was sent, sold or supplied for any of the purposes aforesaid in violation of any of the provisions of this Act, to be distributed among the patrons thereof in proportion to their respective interests in and profits thereof. R.S.O., 1897, c. 251, s. 10.

18.—(1) Any butter or cheese manufacturer who knowingly and fraudulently uses, or directs any of his employees to use for his or their individual benefit, any cream from the milk brought to any cheese or butter manufactory, without the consent of all the owners thereof, shall, for every offence, forfeit and pay a sum not less than $1 nor more than $50, in the discretion of the Justices before whom the case is heard.

(2) Any two or more Justices of the Peace, having jurisdiction within the locality where the offence has been committed, may hear and determine such complaint upon the oath of one or more credible witnesses, and shall have power, in case the penalty and costs awarded by them are not forthwith paid upon conviction, to levy the same by distress and sale of the goods and chattels of the offender, by warrant under their hands and seals or the hands and seals of any two of them, and the penalty, when recovered, shall be paid over by such Justices, one-half to the person complaining, and one-half to the treasurer of the municipality, district or place where the offence has been committed; and in default of payment or sufficient distress, the offender may, by warrant signed and sealed as aforesaid, be imprisoned in the common gaol for a period not less than one day nor more than twenty-five days, at the discretion of such Justices, or any two of them, unless such penalty, costs and the charges of commitment are sooner paid.

(3) Any party aggrieved by such fraudulent conduct as aforesaid may at his election sue the offender in any Civil Court of competent jurisdiction, and recover from him the amount of damages sustained, and levy the same with the costs according to the ordinary practice of the Court in which such action is brought. R.S.O., 1897, c. 251, s. 11.

19. No Justice or Justices having any pecuniary interest in a cheese or butter manufactory as aforesaid, shall hear or determine any complaint under this Act. R.S.O., 1897, c. 251, s. 12.

20. Chapter 251 of the Revised Statutes of Ontario, 1897, and amendments thereto are repealed.

Quebec.—The laws of the province of Quebec which relate to the dairy industry provide for the organization of the Dairymen's Association of the Province of Quebec, and for the formation of syndicates or groups of cheese factories and creameries for the purpose of carrying out a general scheme of instruction. Each group must consist of at least twenty factories and not more than thirty. The officers of these organizations are: President, Vice-President, Secretary-Treasurer, and Inspector. The government contributes half of the salary of the inspector, up to $400 per year. The inspectors travel from factory to factory in their respective groups, giving practical instruction in the manufacture of cheese and butter, and advice to the managers on questions affecting the welfare of the business. Sixty-one of these groups or syndicates are in existence, over each of which there is a duly qualified inspector, who has taken a special inspector's course at the provincial dairy school and is the holder of an inspector's certificate.

The government of Quebec also employs other instructors or inspectors at large, who visit the factories which are not included in the regularly organized groups.

A large dairy school is maintained at St. Hyacinthe, where practical courses in cheese-making, butter-making and milk-testing are given during the winter months.

Prince Edward Island.—The Island province has a well-organized dairy industry. The factory system covers the entire province. The care of the industry is relegated by the government to the Dairymen's Association, which receives an annual grant from the government for the purpose of employing an instructor who visits all the factories. The association collects and publishes statistics of the operations of the cheese-factories and creameries.

Nova Scotia.—This province has no regularly organized dairying service, but it has followed the practice of employing experts to conduct "Traveling Dairies" throughout the province. A complete butter-making outfit is carried from place to place in a specially constructed van. Several days are spent at each place, and the various operations of separating, churning, butter-working and milk-testing, are carefully demonstrated and explained.

New Brunswick.—The government of the province of New Brunswick maintains a dairy school and a well-organized dairying service. The "Dairy Superintendents" as they are called, assist in the organization of cheese factories and creameries, advise the promoters in regard to sites, construction of buildings, equipment and the like. During the working season, they visit the factories regularly for the purpose of giving instruction to the cheese-makers and butter-makers.

Manitoba.—The following law constitutes the dairy legislation of the province of Manitoba:

His Majesty, by and with the advice and consent of the Legislative Assembly of the Province of Manitoba, enacts as follows:

1. This Act may be cited as "The Butter and Cheese Brand Act."

2. In this Act the following expressions have the meanings assigned to them in this section, unless the context otherwise requires:

(*a*) The expression "creamery" means a butter factory where the milk or cream of fifty or more cows is received, or a butter factory of which there are ten or more patrons, or outside persons, contributing milk or cream thereto.

(*b*) A "cheese factory" means any place where cheese is made from the milk of fifty or more cows, or from milk contributed by ten or more patrons.

(*c*) A "private dairy" means any place where butter is made from the milk of less than fifty cows, owned and kept by one person, firm or corporation.

(*d*) "Home dairy cheese" means cheese made on any farm in Manitoba from the milk of less than fifty cows, for which no milk from outside farms is received.

3. The proprietor or person, firm or corporation operating any creamery in Manitoba shall register with the Department of Agriculture and Immigration in Winnipeg a stencil showing the name and address of such creamery, and having the words "Creamery Butter" and the number of the stencil as furnished by the said Department, and shall brand, imprint or impress such stencil on all packages of butter manufactured at such creamery and shipped therefrom.

4. The proprietor or person, firm or corporation operating any cheese factory in Manitoba shall register with the Department of Agriculture and Immigration in Winnipeg a stencil showing the name and address of such factory, and having the words "Full Cream Cheese" and the number of the stencil as furnished by said Department, and shall brand, imprint or impress such stencil on all cheese manufactured at such factory and shipped therefrom.

5. The proprietor or person, firm or corporation operating any private dairy in Manitoba shall register with the Department of Agriculture and Immigration in Winnipeg a stencil showing the name and address of such proprietor or person, firm or corporation, and having the words "Dairy Butter" and the number of the stencil as furnished by said Department, and shall brand, imprint or impress such stencil on all packages of butter containing ten or more pounds made in such dairy and shipped therefrom.

6. Every maker of "Home Dairy Cheese" in Manitoba shall register with the Department of Agriculture and Immigration in Winnipeg a stencil showing his name and address, and having the words "Home Dairy Cheese" and the number of the stencil as furnished by said Department, and shall brand, imprint or impress such stencil on every cheese of eight or more pounds in weight, made and shipped out or sold by him.

7. Every person, firm or corporation who ships butter or cheese on consignment or otherwise from any place in Manitoba, through any common carrier, shall register with the Department of Agriculture and Immigration in Winnipeg a stencil showing his or its name and address and the number of the stencil as furnished by the said Department, and shall brand, imprint or impress such stencil on every package of butter or cheese so shipped by him or it.

8. Every such stencil shall have letters and figures not less than three-eighths of an inch in height and one-quarter of an inch in width.

9. Every person who violates any of the provisions of sections 2, 3, 4, 5, 6 and 7 of this Act shall, on conviction before a Police Magistrate or any two Justices of the Peace, be liable to a penalty of not less than three dollars nor more than thirty dollars, in addition to the costs of the prosecution and in default of payment to imprisonment for a period not exceeding two months.

10. The Minister of Agriculture and Immigration may make such regulations as he may deem necessary for the registering and numbering of such stencils, and for the better carrying out of the provisions and objects of this Act.

11. This Act shall come into force on the first day of June, 1901.

The dairying service of Manitoba includes a well-equipped dairy school, where courses in factory and home dairying are given every winter. There is a superintendent of dairying and two instructors, who visit the cheese factories and creameries during the summer months.

Saskatchewan.—The government of Saskatchewan employs a dairy expert as "Superintendent of Dairying," who exercises a close supervision and semi-control over all the creameries in the province. He assists in the marketing of the butter and keeps accurate statistics of all operations.

Alberta.—The government of the province of Alberta probably exercises the most complete control over the dairy industry within its jurisdiction of any country or state in the world. This province has been the scene of a unique and rather abrupt departure from the line which has generally been followed by governments in assisting agricultural effort. A few creameries had been started in the early nineties, before the creation of the province of Alberta, and while the country was administered by the federal government as a territory; but at the end of two or three years they were, for various reasons, and without exception, acknowledged to be failures. The new settlers who were depending almost wholly on dairying as a means of livelihood, were in a serious position, because, while it was possible for them to make butter on their farms, their facilities were very poor, and there was no way by which individual farmers could find a profitable market for their butter at that time. The Dominion Government came to the rescue and the Dairy Commissioner was authorized to take over the management of the existing creameries, and advance sufficient money to pay off their pressing debts and to make loans for the equipment of new creameries that would come under the same management. The government assumed full control of the creameries, engaged the butter-makers, manufactured the butter at a fixed price, and distributed the proceeds after a sale of the product was effected. Confidence was at once restored, and under expert supervision the business grew and prospered, so that the Dominion Department of Agriculture was able at the end of 1905 to give up the active control of a large number of creameries which had been assisted to a position of independence and stability.

The new Provincial Government is following the policy adopted by the federal authorities, and with a modified plan continues to operate the creameries.

Familiarity with the circumstances leads the writer to assert that this action on the part of the government has laid the foundation for one of the best organized and most satisfactory dairy businesses which is to be found on any part of this continent.

The government work in the interest of dairying in Alberta is performed by a Dairy Commissioner, assisted by several expert instructors.

British Columbia. — The province of British Columbia employs a Commissioner of Live-Stock and Dairying, who gives considerable time to the promotion of the dairy industry.

LEGISLATION RELATING TO THE TRADE IN FERTILIZERS

By *H. J. Wheeler*

The use of various natural manures dates back to ancient times, and the art of manuring has been practiced with more or less continuity until the present. Under the primitive conditions, the need of protective legislation for the benefit of the purchaser of manures was not felt.

History of fertilizer control.

The first steps leading to the modern conditions were, the pointing out by de Saussure of the existence in plants of the mineral elements of the soil, and, more particularly, the promulgation by Justus von Liebig, in 1843, of his "mineral theory." Following the appearance of Liebig's work, these new ideas of the relationship of mineral matter to plant growth were rapidly extended to every part of the civilized world, and the search for and commercial exploitation of manures of various kinds was taken up with enthusiasm. The manufacture of superphosphates from bones, the discovery of guano, nitrate of soda, mineral phosphates, and potash salts, furnished the materials for building up a new industry.

Like all other new undertakings, the manufacture of commercial fertilizers attracted the attention of the honest-intelligent, the well-meaning ignorant, and the intelligent-unprincipled class. The latter sought their prey among the then uninformed and helpless tillers of the soil. It was, therefore, not surprising that the farmer soon became suspicious of many of the fertilizers that were placed on the market, and that the honest manufacturer found himself handicapped in the expansion of his business, not only by this feeling of distrust, but also by unjust competition resulting from the sale of fraudulent goods.

The conditions that soon came to exist in the United States are well illustrated by a statement made by Col. M. C. Weld, in 1869, in relation to the situation in Connecticut. He said, "There is no end to the manures which were absolute frauds upon the farmer; the trouble is to find those which were not." Yet notwithstanding this condition, shortly after the publication of analyses of these goods by the State Board of Agriculture, it was difficult to find poor manures. In Massachusetts, some of the frauds at first perpetrated in the manufacture and sale of fertilizers were notorious. The conditions are well set forth by Dr. James R. Nichols, of Massachusetts, who affirmed, in 1871, "The purchase of commercial fertilizers is full of risk under the most favorable condition," and in reference to the unsatisfactory provision for their examination, he added, "Our State system of inspection and analysis is a kind of legalized quackery." This points to the fact that the time was then ripe for a radical advance in fertilizer legislation and inspection. This fact was keenly realized in Massachusetts, as is shown by the passage, in 1872, of the first really effective fertilizer inspection act placed on record in the United States. The beneficial effects of this measure were far-reaching and attracted wide-spread attention.

New Jersey passed a similar act in 1874, North Carolina in 1877, Connecticut in 1881, and other states followed in rapid succession. These laws provided usually that all packages or lots of fertilizer sold, offered, or exposed for sale should bear the name and address of the manufacturer, the number of net pounds in the package, the brand name, and a guaranteed analysis; though in regard to many other details there have always existed wide differences in the several states.

Present methods of control.

In Canada.—Interest in fertilizer control has not been lacking in Canada, as shown by the provisions of Chapter 108 of the revised Statutes of Canada. This, in turn, was superseded by the "Fertilizers Act," of 1890. This was further supplemented by the "Adulteration Act" of 1906, and still more comprehensive fertilizer legislation is at present under consideration. In its details, the Canadian law is very similar to most of those in the United States, though it differs in certain administrative features. In one particular, it is widely at variance with most of the existing laws, although similar to a clause in the enactments of some of the southern states. Reference is made to the provision that no fertilizer shall be sold, offered, or exposed for sale, unless it contains at least a definite minimum percentage of certain ingredients. In the Canadian law, the restriction applies only to nitrogen and available phosphoric acid, potash, for some reason, having been omitted. This is a class of paternal legislation based on the best of intentions, so far as concerns the consumer, yet it may hamper even him in the legitimate conduct of his business. For example, there would seem to be no defensible reason why one who knew that his land was not in particular need of phosphoric acid should be prevented by law, as in this case, from purchasing a fertilizer carrying both nitrogen and phosphoric acid, provided it contains less than 5 per cent of the latter ingredient.

Under the provisions of Chapter 133, the "Adulteration Act" R. S., c. 107, s. 1., 1906, the scope of the Canadian Fertilizer Act was somewhat extended, it being distinctly provided that any person may submit a sample of fertilizer to the public analyst for examination, and may prosecute the vender thereof, in case it is found to be fraudulent in character. Authority is also given to the Minister, at his discretion, to collect the cost of analysis at specified rates from the vendor, in case the goods are found to be adulterated or falsely marked. Under this latter act, fertilizers are deemed adulterated if they are found deficient to the extent of 1 per cent in any ingredient that is required to be guaranteed. In case the fact of adulteration is established, the goods may then be declared forfeited to the Crown.

In the United States, the execution of the fertilizer law is usually assigned to a commissioner of agriculture, a state board of agriculture, or to the agricultural experiment station. In certain of the states, the execution of the law has been transferred from the experiment stations to such commissioners or boards, while in others, the reverse has taken place. In the latter cases, the changes have sometimes been made on the ground of removal of the inspection from political influences, and because the officials of the experiment station, by virtue of the experimental work that they are conducting, are in better position to make comments on the fertilizers and their use than purely police officials, who may not have enjoyed a training that fits them for the educational features of the work. Nevertheless, unless the inspection can be conducted under such conditions as not to interfere with the work of agricultural investigation, it is better public policy to make it a purely police matter, wholly segregated from the work of investigation. This is true both as concerns its administrative and its analytical features.

If, on the contrary, the transference of the work to the experiment station does not interfere with its legitimate work of investigation, and the inspection can be rid thereby of serious political evils that may have existed, then public policy may justify such a course. It is obvious, therefore, that the choice of plan, in any particular case, must depend on local conditions.

A vital difference in the laws of the several states is that pertaining to the method of raising the revenue with which to defray the cost of inspection. The three methods that have been employed in this country are, direct state appropriation, a brand tax, and a tonnage tax. The latter two are payable by the manufacturer or importer.

Direct state appropriation.—The first method was tried in the state of New York with most unsatisfactory results. This was due to the fact that to insure efficient protection to the consumer it was necessary that, so far as possible, all of the brands sold in the state should be analyzed; and under that system nothing stood in the way of the indefinite multiplication of brands. Individual dealers had their own names affixed to the packages as manufacturers or importers, and adopted brand names without limit, to suit their particular fancy. The New York Agricultural Experiment Station at Geneva, which was intrusted with the execution of the law, soon found itself overwhelmed with samples for analysis, and was thus driven to the necessity of securing an amendment providing for a brand tax, payable by the manufacturer or importer. As a consequence, the hoped-for diminution of brands resulted without delay.

Brand tax.—So far as concerns the brand tax, it is the usual source of revenue for defraying the costs of inspection, in the northern states. This tax is usually placed so low as to cover only the expenses involved, and it is the best way yet tried of insuring a revenue that shall be ample, and yet not in excess of the usual necessities of the case. In some instances, the objection has been raised to the brand tax that, if the sales of a given brand are small, the tax is out of proportion to that when sales are large. It is a notorious fact, however, that the number of brands of fertilizers has been multiplied unnecessarily, solely to meet competition, and entirely apart from the agricultural requirements, in view of which the repressive effect of the brand tax is most valuable.

Tonnage tax.—In the South, the tonnage tax has been frequently adopted, and on solely theoretical grounds it appears to be the most equitable. In certain of the states, this tax not only furnishes the revenue to support the inspection, but also for the chief or sole support of the State Board of Agriculture, and, in at least one instance, for the maintenance of a separate agricultural experiment station. The objection to the tonnage tax is that it involves a large amount of detail for the manufacturer, who must buy and attach the tags which show that the tax has been paid. It is also a direct tax on the fertilizer manufacturer in excess of the usual outlay for inspection, and it thus becomes indirectly a tax on the consumer for the support of work for which the public should properly be taxed, since the work of boards of agriculture and agricultural experiment stations is in the interest of the entire people of the state. The constitutionality of the tonnage tax has already been contested unsuccessfully in the courts by the fertilizer manufacturers, hence the legitimacy of the method remains unquestioned.

In view of all the circumstances, especially in connection with the multiplication of brands under either of the other systems, the brand tax furnishes the most equitable and satisfactory method of raising the needed revenue, even though, on theoretical grounds, the tonnage tax might seem superior. If the volume of sales is sufficient, or if the requirements for protection demand the analysis of a greater number of samples of each brand or more extensive chemical examination, the brand tax can be legitimately raised to meet such necessities.

Difficulties in fertilizer legislation.

In many of the existing fertilizer laws may be found a clause obliging the manufacturer to state the fact in case hair, leather, or certain other inert matter, enters into the composition of his goods. This provision has nevertheless remained more or less inoperative, owing to the difficulty connected with its enforcement. In a certain sense, it might work an injustice to the manufacturer even if it were enforced, for the reason that many of these materials after subjection to severe acid treatment become really efficient sources of nitrogen, while, if they remain untreated, the nitrogen they contain may not be more than one-tenth to one-fifth as valuable as the same amount in the best nitrogenous materials. In view of this condition, one of the great needs at the present time is a satisfactory method of showing the probable efficiency of the organic nitrogen in fertilizers and, if inadequate, the provision of sufficient revenue to permit of its employment in the process of analysis.

In the line of requiring definite detailed statements of the sources of the manurial elements in fertilizers, the laws enacted recently by certain of the western states have gone practically to the limit. Such requirements, if enforced, may prove of great value to the consumer, by enabling him to make a wiser choice of fertilizers for specific purposes; as, for example, when an excess of chlorids should be avoided, when nitrate of soda or nitrate of potash might be especially advantageous, or when sulfate of ammonia might prove disadvantageous owing to unfavorable local soil conditions.

On the other hand, the goods of a manufacturer might be unjustly discredited by insistence on such demands, when, in the process of manufacture, an inert material was so acted on as to make it a really valuable and effective manure. For this reason, if statements of the sources of the material are insisted on, the manufacturer, as a matter of justice, should be given the opportunity to add a supplementary statement to the effect that the material had been subjected to treatment which greatly increases its natural value.

Such legislation, viewed from the most favorable standpoint, is fraught with many objectionable consequences; for no statement of this kind is effective unless it can be proved or disproved by the inspector, and if this cannot be done it becomes a "dead letter," or even a positive drawback to the honest manufacturer who tells the whole truth, and who must meet the competition of men who falsify or withhold the facts. If, therefore, the work of the inspector is done in sufficient detail and with proper thoroughness, the benefits supposed to be gained by the requirement of such statements, nevertheless, are assured to the consumer.

In some of the states, in providing a penalty for the violation of fertilizer laws, an imprisonment clause has been incorporated, but this is so manifestly severe and uncalled for that it is rapidly being eliminated from the statutory provisions.

By way of preventing fraud in the manufacture of fertilizers, nothing could be more productive of good than the wide publicity now given to the analytical results,—a point splendidly illustrated by the early experience in Connecticut, to which reference has already been made. In fact, publicity is feared far more than fines or the forfeiture of goods, though the latter is a provision that might be advantageously made, if suitable safeguards are provided against its improper application. No better illustration of the splendid effects of publicity could be cited than that furnished by the experience of one inspector, who, on requesting a manufacturer whose goods had been found grossly deficient the previous year, to furnish a list of his agents, was informed that he had been unable to secure any, because of the inspector's previous "needless remarks" concerning his goods. Many instances might be cited in which fraudulent goods have been driven from the market by resort to publicity entirely unaided by prosecution.

In drafting laws for the prevention of fraud in the manufacture and sale of commercial fertilizers, there has often been too great a tendency to overlook the rights of, or possible inconvenience to, the manufacturer. No more forceful illustration of this is needed than the great diversity of the individual state requirements in relation to the manner of stating guaranties. These difficulties have interfered greatly with the details of shipment, especially in the case of manufacturers doing business in many sections of the country. For example, in many states a guaranty of nitrogen is required, and in others the nitrogen must be expressed in terms of ammonia. Again, one state may require a guaranty of phosphoric acid, and another a guaranty of phosphoric acid in the soluble, reverted and insoluble condition.

Efforts in the interests of uniformity.

In order to secure greater uniformity in this and other particulars in the laws of the several states, a movement was begun a few years ago which it was hoped would eventually accomplish beneficial results. Committees representing both manufacturers and inspectors held several conferences concerning the points that should be made uniform, and finally the Association of Official Agricultural Chemists of the United States and the Association of American Agricultural Colleges and Experiment Stations adopted by resolutions twenty points that were recommended for observance in all of the states. The action of these associations was later endorsed by the United States Commission on Uniform Legislation. The points covered by these resolutions were the following:

"1. All substances containing nitrogen, potash, or phosphoric acid, sold, offered, or exposed for sale for manurial purposes, excepting the dung of domestic animals when sold as such, should be subjected to inspection.

"2. Each package of manurial substance as above defined, sold, offered, or exposed for sale, should bear a printed, legible guaranty.

"3. The number of net pounds in each package should be stated.

"4. Each package should bear the brand name, or trade-mark, and the name and address of the manufacturer.

"5. The quantities of manurial ingredients should be expressed in percentages.

"6. The guaranteed statements on the packages or forwarded to the inspectors need not be in the form of an affidavit.

"7. Sealed samples of fertilizers offered for sale need not be sent by the manufacturers to the inspectors.

"8. In lots of five tons or less, samples should be drawn from at least ten packages; or, if less than ten packages are present, all should be sampled; in lots of over five tons, not less than twenty packages should be sampled.

"9. Duplicate samples should be drawn and sealed in the presence of the party or parties in interest, or their representatives, one of the samples to be taken by the collector and the other left with the party whose goods were inspected, subject to the call of the manufacturer.

"10. Total nitrogen should be guaranteed in all cases, and nitrogen in the form of nitrates or ammonium salts should be guaranteed separately, if the manufacturer desires credit therefor.

"11. Total phosphoric acid should be guaranteed in all cases, and soluble, reverted, and insoluble, separately, if the manufacturer desires credit therefor.

"12. Potassium should be guaranteed as potash (potassium oxid) soluble in water.

"13. When chlorin is present in fertilizers, manufacturers shall guarantee the maximum percentage thereof.

"14. Only statements of the minimum amount of the substances present, except in the case of chlorin, should be made. For example, instead of guaranteeing from 2 to 4 per cent of potash, guarantees should read thus: 2 per cent of potash.

"15. It should be specified that the methods of the Association of Official Agricultural Chemists should be used for official work.

"16. An imprisonment clause for violation of fertilizer laws should be omitted.

"17. Manufacturers should not be obliged to secure bondsmen.

"18. Commercial valuations should not be affixed to the published analyses of manurial substances.

"19. A definition of the term 'brand' should be inserted wherever a brand tax is assessed.

"20. The guarantee should state the ingredients guaranteed, in the following form and order:

——— per cent phosphoric acid soluble in water.
——— per cent phosphoric acid reverted.
——— per cent phosphoric acid insoluble.
——— per cent phosphoric acid total.
——— per cent nitrogen in nitrates.
——— per cent nitrogen as ammonia.
——— per cent nitrogen total.
——— per cent potash soluble in water.
——— per cent chlorin."

Committees of both of the associations were created to work in the interest of uniform fertilizer legislation in the several states, and in the course of a few years considerable progress was made.

A proposition has been made recently that the terms phosphorus and potassium should be substituted for phosphoric acid and potash, but it has not yet met with universal approval. This, if adopted, would have undone all that had till then been accomplished in the line of securing uniform requirements for guaranties. This incident illustrates the great difficulty likely to be met at any time, so long as the success of a movement for uniformity is dependent on the vagaries of the individual states. This suggests certain advantages that might arise from a measure of control of interstate traffic in fertilizers on the part of the federal government. A movement already made in this line, however, has met with much determined opposition in several states, doubtless through fear that, in some cases, it would lead to the abandonment of local inspection, and in other cases possibly cut off certain present sources of revenue.

Publicity of fertilizer analyses.

In practically all of the states, at the present time, the complete analyses of the fertilizers are published, a plan necessarily involving considerable expense. In consequence, suggestions have been made that the expense could be greatly lessened by publishing only the analyses of such goods as are found to be below their guaranties. This, however, has not met with general favor, since, if the examination is thorough, much useful information is furnished by the analyses which may be of as great value to the consumer, in connection with goods above their guaranties, as with those below. For example, many farmers now wish to know whether the nitrogen is present in nitrates, ammonium salts or organic matter, also whether the fertilizer contains much or little chlorin, and whether any considerable amount of the phosphoric acid is soluble.

Wherever there is a tendency on the part of administrative officers to abbreviate unduly the chemical examinations, statutory provision for greater detail might often be advantageously made. Above all else, the inspector should not be hampered by law from extending the chemical work to the limit of determining everything of value to the consumer, or be limited to any given method of procedure or analysis, since the methods of the Association of Official Agricultural Chemists of the United States are now usually followed, and these are being improved by changes from year to year. If the methods now being studied are perfected satisfactorily, it may become desirable in the near future to determine the probable degree of availability of the organic nitrogen in all mixed fertilizers, and there should be no legal hindrance to such a course. Whenever, also, the presence of inferior aluminum phosphates is suspected, determinations of alumina may be desirable as a means of revealing the quantity present, and thus of indicating the probable efficiency of the available and insoluble phosphoric acid. There should likewise be no barrier to prevent the inspector from determining the chlorin, as a means of showing what potassium salts were probably employed in the mixture.

The use of a minimum and maximum statement in the guaranty was doubtless introduced originally with the good intention of showing the possible ranges in composition that might be expected to appear. Nevertheless, at present it seems to be employed chiefly to mislead the farmer, for the real intent of the manufacturer is to exceed the lowest statement as little as possible in his effort not to have the goods fall below that limit. It would appear, therefore, to be of positive advantage to the consumer if the use of the higher statement were prohibited.

The commercial valuation of fertilizers has always been "a thorn in the flesh" of the manufacturer. It has been asserted that it is unconstitutional, that no other commodity is so valued, that it is paternal, and positively pernicious. To this the reply has been made that the prices given, often under the head of "valuation," merely represent the cost of like amounts of potash, phosphoric acid, and nitrogen in the best forms of unmixed fertilizer ingredients; furthermore, that, owing to the inability of the chemist to determine the exact source of all of the materials entering into the goods, he could not, if he would, actually place a valuation on a particular brand.

It is also argued that if the publication of valuations is omitted, the consumer will be forced to a study of the chemical composition of the goods as a criterion of their merits, and, therefore, will be more likely to purchase brands adapted to his soil and crops. Again, if the value of the goods is used as the sole guide to the purchaser, he may, for example, buy a high-priced potassic and nitrogenous manure, even when a highly phosphatic one is required. Thus, the results, by way of crops, may be disastrous, even though the consumer received a full commercial equivalent for his money. It cannot be denied, therefore, that the commercial valuation may sometimes mislead the ignorant purchaser, or that unscrupulous agents may use such a valuation to sell goods poorly adapted to special requirements. So far as the well-informed farmer is concerned, the valuation is not necessary to his protection, and it merely spares him the effort of calculation. In view of the present widely diffused knowledge of fertilizers, it is now held by many progressive agricultural leaders that the time is ripe for discontinuing the publication of valuations, in the hope that thereby even greater discrimination and intelligence will be shown in the purchase and use of fertilizers.

LEGISLATION RELATING TO THE TRADE IN FEED-STUFFS

By *W. H. Jordan*

Concentrated commercial feeding-stuffs are now found in the markets of the United States in great variety as to kind and quality. Formerly, our markets supplied only the ordinary farm grains, either whole or ground, and certain milling offals, especially those coming from the grinding of wheat. In later years, many manufacturing industries have been added to those previously existing, the by-products of which are available as food for cattle, and have been placed on the market in numerous forms and mixtures. These include the offals from the manufacture of oils, spirituous beverages, starch and glucose, breakfast-foods, beet-sugar, milling offals and wastes, and other minor industries. Many of these by-product feeds are a valuable addition to the list of available cattle foods, while others are inferior in value.

Within the past twenty years, especially within the past ten, the situation in the cattle-food market has become such as to require laws to defend the purchaser against fraudulent or inferior feeds and mixtures of feeds. There are several ways in which buyers are being imposed on: Mixtures that have the appearance of corn and oats ground together are made by the use of corn meal or hominy chop and ground-oat hulls, sometimes a small proportion of a highly nitrogenous feed being added to make the composition of the mixture correspond to certain accepted standards; ground corn-cobs are mixed with wheat-bran in a way to deceive all but the expert judge; coarse fodders are ground and mixed with grain and sold at grain prices; mill screenings and sweepings are used as a part of certain mixtures, especially in so-called molasses feeds, thus selling to farmers, at grain prices, weed seeds whose feeding value is uncertain and which may be distributed over the land in a condition to germinate; and otherwise standard materials are sophisticated by adding more of some ingredient naturally present in small quantities, as, for example, increasing the proportion of hulls in cottonseed meal or of buckwheat hulls in buckwheat middlings. These are some of the conditions that have led to the enactment of laws providing for the inspection and control of the sale of concentrated commercial feeding-stuffs.

Objects of the laws.

The main objects to be accomplished by these laws are the following:

(1) The defense of purchasers against fraudulent feeds, or those inferior in quality.

(2) The enlightenment of consumers as to the character and composition of the feeds that appear in the market.

The laws that have been enacted with these results in view were first put in force in the New England states, ten or twelve years ago, and have now found a place on the statue books of about thirty states, mostly in the East and South.

Requirements of the laws.

In a general way, these laws make the following requirements:

(1) The registration in the office of some state official of certain facts concerning every brand of goods sold, viz., name of the manufacturer or jobber together with the place of manufacture or business, brand name, and the guaranteed analysis of the feed.

(2) The branding of packages with statements similar to those that are registered and also with the weight of the contents of the package. Goods sold in bulk must be accompanied by the required statements, or these statements must be available to the purchaser.

(3) In some states, the names of the ingredients of the mixture must be placed on the package.

(4) The payment, in some states, of a ton tax, or a license fee for each and every brand offered for sale, the proceeds applied in paying the expenses of the inspection. In many states, an appropriation is made to defray the cost of inspection.

(5) The annual inspection of the feeds found in the market to determine whether the guarantees are being met, this inspection being placed in the hands of some state department or state official, such as a department of agriculture, a state chemist, or the director of an experiment station.

(6) A penalty for the violation of the provisions of the law.

The laws are by no means uniform in the various states, especially as to the guaranteed analysis that is required, and the source of the means of defraying the cost of the inspection. In many states, only the percentage of protein and fat must be registered, while in other states there is required in addition the maximum proportion of crude fiber present, and in a few cases the percentage of nitrogen-free extract. As stated, the source of income for meeting the expense of the inspection is sometimes a lump appropriation by the state, and often either a ton tax on every ton of goods placed in the market or a license fee for every brand offered for sale.

Results.

It is interesting to inquire whether the inspection of commercial cattle foods is accomplishing all that is expected of it. Undoubtedly, the existence of these laws on the statute book and their enforcement has had great informational value, and has been a deterrent of dishonest practices on the part of manufacturers. On the other hand, it must be confessed that the number of inferior brands of goods placed on the market has steadily increased. Reference is made to the compounded feeds that carry some disguised ingredient of low value, such as oat hulls, ground corn-cobs, mill screenings, or other ground materials that should not be sold at grain prices.

It is evident that laws so far enacted are not protecting so fully the interests of buyers of commercial feeds as should be the case. This is probably due to an insufficiency in the terms of these laws. In a majority of states, it is required only that the guaranteed percentages of crude protein and crude fat shall be filed, which information is not a sufficient basis for judging the quality of a cattle food. It is possible, for example, by a skilful combination of cottonseed meal, hominy chop and oat hulls, to compound a mixture that makes a satisfactory showing in its content of protein and fat, but is inferior in nutritive value because of the presence of a highly indigestible ingredient. In the same way the so-called "molasses feeds," sometimes containing weed seeds of unknown feeding value and dangerous to the farmers' fields, may contain percentages of protein and fat that compare favorably with those found in farm grains. Very recently, also, it has been learned that certain gluten feeds have been brought to a desirable color by the use of coal-tar dyes. This all means that in order to judge the value of a feeding-stuff it is necessary to know not only the content of protein and fat but also the proportion of crude fiber present.

It is even more important to know the ingredients from which a feed is compounded and any special treatment it has received, and the law for the control of the sale of such commodities should contain rigid provisions for obtaining such knowledge—provisions that should be strictly enforced. There is hardly any existing commercial condition more inimical to the interests of those who depend on a supply of commercial feeds than the presence in the markets of feeds so compounded as to disguise to the ordinary observer some inferior ingredient that has been introduced. Such deception appears to be a controlling purpose in the compounding of many feeds now offered for sale.

With the present situation of the cattle-food market, when by-products vary greatly in composition and quality, which may be sold so disguised as not to be recognizable from ordinary observation, and with the prospect of a steady increase in these by-product feeding-stuffs, inspection laws will not be efficient unless they secure to the farmer a full knowledge of the nature of the materials he is buying. To this end, every package or lot of feeding-stuff should be accompanied by a statement of the true names of all the ingredients contained in the feed.

Two means are generally provided for rendering these inspection laws effective: the payment of a fine when violation of the terms of the law is established, and the publishing of the results of the inspection. Without question, the latter means is the more effective in preventing the sale of fraudulent or inferior goods. Dishonest manufacturers and dealers stand more in fear of publicity than of fines. It may even be profitable to sell fraudulent feeds and pay the fines imposed, but the influence on trade of public condemnation is something to be dreaded. The work of an inspecting bureau or official should receive the widest publicity.

LEGISLATION RELATING TO THE TRADE IN FRUITS IN CANADA: THE FRUIT MARKS ACT.

By *P. W. Hodgetts*

Canada is in rather a pecular position in respect to her fruit trade. The export of fresh fruit is confined almost entirely to the apple, but in this fruit her trade exceeds even that of the United States. In 1906, she exported 1,217,564 barrels, valued at $4,083,482, while the United States, in the same year, shipped 1,208,989 barrels, valued at $3,751,375. Canada's principal markets are Great Britain and her own western provinces. In the early years of the trade much unscrupulous grading and packing was done and inferior fruit shipped, with the result that, despite the excellent quality of her apples, she was losing her hold on these markets. The honest growers and dealers became alarmed, and after years of patient working and agitating, secured the present legislation.

The earliest record referring to the need for government official inspection and branding of fruit in Canada is contained in the report of the Fruit Growers' Association of Ontario, for 1899. Mr. A. Alexander, of Hamilton, there stated: "The fruit-growing interests of Ontario are of sufficient importance for this Association, even if they asked government aid for it, to have three or four inspectors to brand fruit as marked by the growers." This matter was taken up in the following years, and became of increasing interest, as shown by the discussions recorded in the annual reports of this Association. Perhaps the one most untiring in his efforts toward a solution of this problem was Mr. A. H. Pettit, a prominent fruit-grower in the Niagara peninsula, and a life-long member of the Ontario association. At the annual meeting in 1890, Mr. Pettit outlined a comprehensive scheme for grading apples according to certain fixed standards, and branding the package subject to government inspection. He stated, "The Inspectors' brand will then become an important factor in raising the standard of Canadian apples, and thereby increase the marketable value in any market to which they may be sent."

A special committee was appointed to deal with this matter, which brought in the following resolution: "That we believe a system of inspection to be in the best interests of the fruit-growers and consumers, for such fruits as are shipped in barrels and closed packages, and that the government be requested to appoint inspectors for that purpose." This matter was laid before the federal government that year, and again in 1891, with the result that an act was passed so much more stringent than asked for that it was found to be unworkable. Section 109, Clause I, required that the inspector open one package in five, and if any fraud is found, then every package shall be examined. Clause IV allowed a charge of ten cents a package to the inspector. Under Section 110, two grades were defined as follows: "No. 1 inspected Canadian apples shall consist of perfect specimens of one variety of uniform size, and, in the case of a colored variety, of fairly uniform color, and shall be free from scab, worm-holes, knots, and blemishes of any kind. No. 2 inspected Canadian apples shall consist of specimens of one variety, free from scab, worm-holes, knots and blemishes of any kind, but not of uniform size and color."

Acting under advice from the Fruit Growers' Association the government amended these grades to read as follows: "No. 1 inspected Canadian apples shall consist of well-grown specimens of one variety of nearly uniform size, of good color, sound, free from scab, worm-holes and bruises, and properly packed. No. 2 inspected Canadian apples shall consist of specimens of one variety, reasonably free from the defects mentioned in Class I, but which, on account of the inequality of size, lack of color, and other defects, could not be included in that class."

This act, while good in itself, was not enforced, no inspectors being appointed, as none would undertake the work on the mere chance of getting an occasional carload of apples at ten cents per barrel; nor would they assume the responsibility of marking the grades from one barrel in five, guaranteeing that the others came up to such grade. As a result of these conditions, very little good followed from the passing of the act, and the only step forward in the next few years was in the passing of a provincial act, in 1895, for the suppression of fraud in the sale of fruit. The principal objects aimed at were to prevent the changing of grade marks, and the use of wrong marks, and the covering of poor fruit with good fruit, or overfacing. In 1898, an invitation was sent to the fruit-growers' associations of the other provinces to unite in discussing with the government among other things, the advisability of adopting some system of inspection and grading.

In 1899, Prof. J. W. Robertson, then Commissioner of Agriculture for the Dominion of Canada, met the growers in convention and made certain proposals, which, on the whole, met with the approval of those present. These included, first, some officially recognized standard of size, quality, and variety for apples packed for export; second, the branding of the name of the grower and of the packer on every closed package; third, the use of a standard package only; and fourth, fixed penalties for frauds committed under these headings. Strong objection, however, was taken to placing the name of the grower on the package, as in many cases the fruit passes beyond his control before packing, and, therefore, it would be a great injustice to him if improperly packed.

A committee was appointed which, during the year, drafted a bill and submitted it to the Parliament in 1900. Considerable opposition developed at that time from the dealers, and the act was laid over for further discussion. At the annual meeting of the Ontario association in December of that year, the matter was discussed from all sides and some changes accepted in the wording.

The fruit marks act.

As a result of these conferences and committee meetings, the act known as the Fruit Marks Act was assented to, May 23, 1901. This act prescribed that all closed packages, boxes and barrels should be marked, first, with the name and address of the owner of fruit at the time of packing; second, with the variety of the fruit; and third, with the grade. Only one grade was defined, and all marks were indicated that usually described such grade. One clause of the act prohibited the selling of any package, either open or closed, in which the faced or shown surface gives a false representation of the contents of such package.

The instructions to inspectors were very broad. Boxes and barrels only were considered closed packages, baskets being subject simply to the clause referring to overfacing. "Bruises" were defined as only those injuries that produce decay or otherwise materially lessen the value of the fruit for consumption. "Nearly uniform" is to be taken as including any size of fruit except that which may be fairly classed as small for the variety: "scab" to be considered particularly where it causes appreciable waste.

The act was passed in the summer of 1901, and, that fall, the time of the inspectors was taken up almost entirely in educating the growers and packers to the requirements of the act and the latest and best methods of packing. When faults were found at the points of shipment, the packers were immediately notified and shown where improvement was necessary. If fraud was shown, warnings were issued that a repetition of such offence would be followed by a prosecution. Considerable latitude was allowed the inspectors, and their discretion has been such that they are now considered the friends of the fruit-growers,—in fact, teachers rather than detectives.

After a few years, flaws were naturally found to exist in the law, and several amendments have been made, principally as a result of the conference of fruit-growers of the Dominion held in Ottawa, March, 1906. These changes were framed, however, to increase the strictness of the act and for more careful grading of the fruit. While the original act defined only one grade, three are now outlined, and a fourth is provided for. The name of packer, address and grade must now be in letters of not less than one-half inch in length, and grade marks must include one of the four named. As the act now stands, the principal clauses read as follows:

Interpretation

319. In this part, unless the context otherwise requires,—

(*a*) 'closed package' means a box or barrel of which the contents cannot be seen or inspected when such package is closed;

(*b*) 'fruit' shall not include wild fruit, nor cranberries, whether wild or cultivated.

(*c*) 'culls' shall include fruit that is either very small for the variety, or immature, or the skin of which is broken so as to expose the tissue beneath, or that is so injured by insects, fungi, abnormal growths, or other causes, as to render it unmerchantable.

The Marking of Fruit

320. Every person who, by himself or through the agency of another person, packs fruit in a closed package, intended for sale, shall cause the package to be marked in a plain and indelible manner, in letters not less than half an inch in length, before it is taken from the premises where it is packed,

(*a*) with the initials of his Christian names, and his full surname and address, or, in the case of a firm or corporation, with the firm or corporate name and address;

(*b*) with the name of the variety or varieties; and

(*c*) with the designation of the grade of fruit, which shall include one of the following four marks, viz., Fancy, No. 1, No. 2, No. 3.

(2) Such mark may be accompanied by any other designation of grade or brand, if that designation or brand is not inconsistent, with, or marked more conspicuously than, the one of the four said marks which is used on the said package.

321. No person shall sell, or offer, expose or have in his possession for sale, any fruit packed,

(*a*) in a closed package and intended for sale, unless such package is marked as required by the provisions of this Part;

(*b*) in a closed package, upon which package is marked any designation which represents such fruits as of

(I) fancy quality, unless such fruit consists of well grown specimens of one variety, sound, of uniform and of at least normal size and of good colour for the variety, of normal shape, free from worm holes, bruises, scab and other defects and properly packed.

(II) No. 1 quality, unless such fruit consists of well grown specimens of one variety, sound, of not less than medium size and of good colour for the variety, of normal shape and not less than ninety per centum free from scab, worm holes, bruises and other defects, and properly packed.

(III) No. 2 quality, unless such fruit includes no culls and consists of specimens of not less than nearly medium size for the variety, and not less than eighty per cent free from worm holes and such other defects as cause material waste, and properly packed

(*c*) in any package in which the faced or shown surface gives a false representation of the contents of such package; and it shall be considered a false representation when more than fifteen per centum of such fruit is substantially smaller in size than, or inferior in grade to, or different in variety from, the faced or shown surface of such package.

Branding falsely marked and falsely packed

322. Whenever any fruit in any package is found to be so packed that the faced or shown surface gives a false representation of the contents of the package, any inspector charged with the enforcement of this Part, may mark the words "Falsely packed" in a plain and indelible manner on the package.

(2) Whenever any fruit packed in a closed package is found to be falsely marked, the said inspector may efface such false marks and mark the words "Falsely marked" in a plain and indelible manner on the package.

(3) The inspector shall give notice, by letter or telegram, to the packer whose name is marked on the package, within twenty-four hours after he marks the words "Falsely marked" or "Falsely packed" on the package.

Fruit packages

325. All apples packed in Canada for export for sale by the barrel in closed barrels shall be packed in good and strong barrels of seasoned wood having dimensions not less than the following, namely: Twenty-six inches and one-fourth between the heads, inside measure, and a head diameter of seventeen inches, and a middle diameter of eighteen inches and one-half, representing as nearly as possible ninety-six quarts.

(2) When apples, pears or quinces are sold by the barrel, as a measure of capacity, such barrel shall not be of lesser dimensions than those specified in this section.

(3) When apples are packed in Canada for export for sale by the box, they shall be packed in good and strong boxes of seasoned wood, the inside dimensions of which shall not be less than ten inches in depth, eleven inches in width and twenty inches in length, representing as nearly as possible two thousand two hundred cubic inches.

(4) When apples are packed in boxes or barrels having trays or fillers wherein it is intended to have a separate compartment for each apple, the provision of this section as to boxes and barrels shall not apply.

326. Every box of berries or currants offered for sale, and every berry box manufactured and offered for sale, in Canada shall be plainly marked on the side of the box, in black letters at least half an inch square, with the word "Short," unless it contains when level-full as nearly exactly as practicable,

(*a*) at least four-fifths of a quart; or,

(*b*) two-fifths of a quart.

(2) Every basket of fruit offered for sale in Canada, unless stamped on the side plainly in black letters, at least three-quarters of an inch deep and wide, with the word "Quart" in full, preceded with the minimum number of quarts, omitting fractions, which the basket will hold when level-full, shall contain, when level-full, one or other of the following quantities,

(*a*) Fifteen quarts or more,

(*b*) Eleven quarts, and be five and three-fourths inches deep, perpendicularly, eighteen and three-fourths inches in length, and eight inches in width at the top of the basket; sixteen and three-fourths inches in length, and six and seven-eighths inches in width at the bottom of the basket, as nearly exact as practicable, all measurements to be inside of the veneer proper and not to include the top band.

(*c*) Six quarts, and be four and one-half inches deep, perpendicularly, fifteen and three-eighths inches in length, and seven inches in width at the top of the basket; thirteen and one-half inches in length, and five and seven-eighths inches in width at the bottom of the basket, as nearly exact as practicable, all measurements to be inside the veneer proper, and not to include the top band. Provided that the governor in council, may, by proclamation, exempt any province from the operation of this section.

(*d*) Two and two-fifth quarts, as nearly exact as practicable.

Inspectors' right to examine

327. Any person charged with the enforcement of this Part may enter upon any premises to make examination of any package of fruit suspected of being falsely marked or packed in violation of any of the provisions of this Part, whether such packages are on the premises of the owner, or on other premises, or in the possession of a railway or steamship company.

328. Every person who, by himself or through the agency of any other person, violates any of the provisions of sections 320 and 321 of this act, shall be liable, for the first offence, to a fine not exceeding $25 and not less than $10; for the second offence, to a fine not exceeding $50 and not less than $25; and for the third and each subsequent offence, to a fine not exceeding $200 and not less than $50, together, in all cases, with the costs of prosecution; and in default of payment of such fine and costs shall be liable to imprisonment, with or without hard labor, for a term not exceeding one month, unless such fine and costs, and the costs of enforcing them, are sooner paid.

2. Whenever any such violation is with respect to a lot or shipment consisting of fifty or more closed packages, there may be imposed, in addition to any penalty provided by this section, for the first offence twenty-five cents, for the second offence fifty cents, and for the third and each subsequent offence one dollar, for each closed package in excess of fifty with respect to which such violation is committed.

Tampering with marks

329. Every person, who, not being an inspector, wilfully alters, effaces or obliterates, wholly or partially, or causes to be altered, effaced or obliterated, any marks on any package which has undergone inspection, shall incur a penalty of forty dollars.

Offences and penalties

330. Every person who offers or exposes for sale, or who packs for exportation, apples, pears, or quinces, by the barrel or box, otherwise than in accordance with the foregoing provisions of this Part, shall be liable, on summary conviction, to a penalty of twenty-five cents for each barrel or box of apples, pears, or quinces so offered or exposed for sale or packed.

(2) Every person who, for export, offers or exposes for sale or packs, apples by the box otherwise than in accordance with the foregoing provisions of this part, shall be liable, on summary conviction, to a penalty of twenty-five cents for each box of apples so offered or exposed for sale or packed.

331. Every person who neglects to comply with any of the provisions of this Part relating to boxes of berries or currants, or berry boxes, or baskets of fruit, or who sells or offers for sale any fruit or berry boxes in contravention of any of the said provisions shall be liable, on summary conviction, to a fine of not less than twenty-five cents for each basket or box so sold or offered for sale.

332. Every person who obstructs any person charged with the enforcement of this Part in entering any premises to make examination of packages of fruit as provided by this Part, or who refuses to permit the making of any such examination, shall be liable to a penalty not exceeding five hundred dollars and not less than twenty-five dollars, together with the cost of prosecution, and in

default of payment of such penalty and costs, shall be liable to imprisonment, with or without hard labor, for a term not exceeding six months, unless such penalty and costs and the cost of enforcing the same are sooner paid.

333. The person on whose behalf any fruit is packed, sold, offered, or had in possession for sale, contrary to the provisions of the foregoing sections of this Part, shall be *prima facie* liable for the violation of this Part.

Procedure

334. For the purposes of jurisdiction under Part XV of the Criminal Code, in any complaint, information or conviction for a violation of any of the provisions of this Part, the matter complained of may be alleged and shall be held to have arisen at the place where the fruit was packed, sold, offered, exposed or had in possession for sale.

335. No appeal shall lie from a conviction under this Part except to a superior, county, circuit or district court, or the court of the sessions of the peace, having jurisdiction where the conviction was had; and such appeal shall be brought, notice of appeal in writing given, recognizance entered into or deposit made, within ten days after the date of conviction.

(2) The trial on any such appeal shall be heard, had, adjudicated upon and decided, without the intervention of a jury, at such time and place as the court or judge hearing the trial appoints, and within thirty days from the date of conviction, unless the said court or judge extends the time for hearing and decision beyond such thirty days.

(3) In all respects not provided for in this Part, the procedure under Part XV of the Criminal Code shall, so far as applicable, apply to all prosecutions brought under this Part.

Benefits of the act.

As to its merits, from the conclusion of the first year's operations to the present time, few Canadians interested in the fruit business would have anything but praise for the principles embodied in the Fruit Marks Act. True, some of the dealers have shown their disapproval of it by endeavoring in every way possible to evade the provisions that interfere with their conducting a dishonest business. Under conditions previous to 1901, many of these men bought and packed in one section of the country one year, then moved to other sections the next year, where their methods of business were unknown. Others again, and among these some large dealers, packed both poor and good grades, attaching their name only to the latter, and trusting to over-facing and other dishonest methods to make consumers pay a fair price for the poor stuff. These men naturally care nothing either for the good name of the country or of its products, and cannot or will not see that in the long run such action will spoil even their own markets. Their spite naturally shows itself against any movement that tends to restrict their operations, and they are opposed to the act in all its sections. Fortunately, the number of such unscrupulous dealers is comparatively small, and they merely serve to show the necessity for the act. The fruit-trade as a whole, evidences strong support of the law.

Where the growers do their own packing either in person or through coöperative shipping associations, their support of this legislation is unanimous, and, in fact, they are now agitating for more strict definition of grades and heavier penalties for infractions of the law. Of the prosecutions that have been started by the inspectors, none of them have as yet been instituted against a coöperative association, forty or fifty of which are in operation in the Dominion.

In fact, a score of leading apple-growers, when asked this year by the writer for their candid opinion of the act, wrote strongly in every case of its value to the fruit-growers of Canada. Its weaknesses are recognized, and Canadians, as fruit-growers, hope to see most of these overcome; but none would think of returning to the days of freedom from legal control previous to the passing of the act.

It has accomplished in Canada, first, a revolution in the interest taken in the general care of the orchards looking toward producing fruits up to the grades called for in the act; second, it has driven out of business dishonest dealers and packers and forced the growers to organize for their own packing and marketing; third, packers now have some personal risk and are consequently more careful in their work; fourth, owing to the educational work of inspectors, great improvement has resulted in the methods of packing; fifth, in British Columbia, where only the box package is used, home-grown fruits are now bought by grade, and used to the exclusion of much of the fruit from the neighboring states, which formerly held first place. In the older provinces, especially Ontario, where the barrel is, as yet, almost the universal package for apples, immense quantities are purchased f. o. b. station, at a certain fixed price for No. 1 and No. 2 grades, while almost all contracts are based on the government standards of grades. Both buyer and seller now have a fair idea at least of the class of fruit dealt with, and prices are more or less fixed according to grade and variety as early as possible in the season.

To quote from a recent letter written from Great Britain by a person who is in close touch with the fruit trade there, "Canadian fruit was an object of suspicion and mistrust on all hands, the dependable brands being very few in number, and the trade in a most chaotic state. Since the act has been passed and intelligent inspectors appointed, confidence has been restored to a degree that is truly remarkable, and the Canadian fruit trade in England has been placed on a sound and permanent basis.

"To say that there is no longer either fraud or incompetency detected in the grading and packing of Canadian apples as offered in these markets would be to exaggerate and mislead; but, even as things are, market quotations show that Canadian fruit is ranked shillings higher per barrel than fruit of the same varieties from other countries. Some of this difference may be attributable to the fine quality of our more northerly product and some to the size of the Canadian barrel; but, in the main, I do not hesitate to say that this difference has been brought about and maintained because of a general confidence in the grading and packing of Canadian apples since the Fruit Marks Act has been in force."

One of the largest dealers, in writing of this act, states that it "is not perfect, but it is useful and necessary. It has changed the system of packing and grading entirely, and given more confidence to the buyer. Packers have some risk now which was avoided before. Growers are less liable to bribe the buyers' packers, and the trade generally has been benefited."

As previously stated, the experience of the past seven seasons has shown weakness in this act, most of which has been already remedied. There is still considerable trouble with a few packers and shippers who wilfully break the law, season after season, making light of the fine and trusting to escape the inspectors in most attempts at fraud. For such, increased penalties are now urged after the second offence, and imprisonment when deliberate fraud is proved.

Again, in seasons such as 1907, the export of large quantities of low-grade fruit spoils the market for the better grades. The dealers, carried away by reports of short crops everywhere, paid prices out of all reason for apples in the orchard; and, in trying to clear themselves of loss, packed and shipped fruit which ordinarily they would not touch. It is advocated by some that the act should refuse to allow export of a lower grade than No. 2 in boxes or barrels.

A clearer definition is also asked of the words "material waste" in the No. 2 grades. At present, some difference of opinion exists in the minds of the packers as to what constitutes such waste, and it is believed that a better wording could be adopted. Under the definition of "fancy grade" the term "uniform" is used, and, as this presupposes a practically perfect condition, it is felt that for commercial purposes it should be modified to read "nearly uniform." At present the Act prescribes a minimum legal size for the barrel and box, but growers would like to see a uniform size adopted for both these packages.

Despite the difficulties in the way of its adoption, and the shortcomings in the act itself, fruit-growers in Canada today are unanimous in their praise of its workings. Provincial, district and local associations without exception, over the Dominion, consider this legislation invaluable, and all growers are aiming to produce fruit up to the standards adopted therein. Its results have met fairly well the expectations of those who worked so faithfully for its accomplishment, and the fruit trade in Canada — growers, packers, dealers and consumers—look forward to even better results as the act becomes more familiar and the grading and packing become more uniform over the larger areas.

SEED CONTROL AND SEED LEGISLATION

By *Edgar Brown*

Interest in seed testing and seed control dates from the beginning made by Dr. Nobbe, at Tharand, Germany, in 1869. He it was who first called attention to the abuses that had arisen in the seed trade, and, in order to correct them, established a laboratory for the analysis of seeds. As a result of the work done by him and, later, by those who followed his example, the present system of seed control, now common throughout Europe, has been built up. Many of the so-called seed-control stations were started by private enterprise or under the auspices of agricultural societies, and, later, were attached to agricultural experiment stations, or other public institutions. There are now more than one hundred such seed-control stations in Europe. This system of seed control has been built up, practically, without the aid of legislation, relying, for its continued support, on the farmers' demand for guaranteed seeds.

The general plan is for seed firms to make a contract with the control station, by which the seed firm sends to the control station samples of certain lots of seeds. These are then tested for mechanical purity and germination, and certificates of analysis sent to the seedsman. As this seed is sold, a copy of the certificate is sent to every customer, who has the privilege, under certain restrictions, to send a sample of the purchased seed to the control station to be tested free of charge. When the second sample does not prove of so good quality as the first, the seedsman reimburses the purchaser for the difference in value. Such a system has numerous advantages. The seedsman not only guarantees the quality of the seeds he sells, but pays for the second analysis. The purchaser, in order to avail himself of the privilege of re-examination, must send the sample immediately on receipt of the seed, and in this way he knows the exact quality of the seed he is using before sowing. The seedsman, knowing that the purchaser is entitled to re-examination, is not likely to supply seed of a lower quality than that indicated by the guarantee. In this way, the purchaser is fully protected without legislation or an elaborate inspection system which the enforcement of a law would require.

Seed legislation in Canada and the United States.

The European seed-control system has not been adopted either in the United States or Canada. While seed-testing laboratories have been established at several of the state agricultural experiment stations, at the Department of Agriculture, at Washington, in the United States, and at the Department of Agriculture at Ottawa, Canada, no contracts for testing are made with seedsmen.

Canada.—In Canada, the "Seed Control Act of 1905," although not establishing standards for the germination of seeds, is very strict as to the presence of weed seeds. Under this act, no seeds of cereals, grasses, clovers or forage plants can be sold for seeding purposes in Canada which contain seeds of the following weeds: wild mustard, or charlock (*Brassica sinapistrum*, Boiss); tumbling mustard (*Sisymbrium sinapistrum*, Crantz.); hare's-ear mustard (*Conringia orientalis*, Dumort); ball mustard (*Neslia paniculata*, Linn. Desv.); field penny-cress, or stinkweed (*Thlaspi arvense*, Linn.); wild oats (*Avena fatua*, Linn. and *A. strigosa*, Schreb.); bindweed (*Convolvulus arvensis*, Linn.); perennial sowthistle (*Sonchus arvensis*, Linn.); ragweed (*Ambrosia artemisiaefolia*, Linn.); great ragweed (*A. trifida*, Linn.); purple cockle (*Lychnis githago*, Lam.); cow cockle (*Vaccaria vaccaria*, Linn. Britton); orange hawkweed or paint brush (*Hieracium aurantiacum*, Linn. and *H. praealtum*, Vill.); sclerotia, known as ergot of rye (*Claviceps purpurea*, Tul.); unless each package is labeled (*a*) with the full name and address of the seller; (*b*) with the name of the kind or kinds of seeds; (*c*) with the common name or names of any of the above weeds the seeds of which are present in the seed.

No seeds of timothy, red clover, alsike, or any mixture containing these seeds, can be sold as No. 1 or first quality, unless it is free from seeds of the above weeds and also free from seeds of the following: white cockle (*Lychnis vespertina*, Sibth.); night-flowering catchfly (*Silene noctiflora*, Linn.); false flax (*Camelina sativa*, Crantz.); Canada thistle, (*Cnicus arvensis*, Hoffm.); ox-eye daisy (*Chrysanthemum leucanthemum*, Linn.); curled dock (*Rumex crispus*, Linn.); blue weed (*Echium vulgare*, Linn.); rib-grass (*Plantago lanceolata*, Linn.); chicory (*Cichorium intybus*, Linn.).

No seeds of timothy, alsike or red clover, or any mixture of them, can be sold for seeding purposes in Canada if they contain more than five seeds per thousand of any or all of the seeds named in the two lists above. The labeling provision of this law does not, however, apply to sale of seed by a grower for seeding by the purchaser, and none of the provisions of this act apply to seeds sold direct to merchants to be recleaned, or to seed sold for export.

The result of the operation of this law during the last three years has been greatly to decrease the sale of low-grade seeds in Canada, and to improve the quality of the seed crops harvested. This latter condition has resulted from the Canadian dealers being more careful in their buying than formerly, and consequently the farmers have taken greater pains in destroying the weeds growing on their farms.

In the United States, there is no federal law governing the sale of agricultural seeds, although bills for the regulation of the seed trade have been before Congress at different times. In several of the states, laws have been enacted touching various phases of the seed question. A summary of these state laws is here given:

Florida.—All garden, melon or vegetable seed must be labeled, showing the date, place of growth and name of grower.

North Carolina.—All garden and vegetable seeds must be labeled with the year of growth.

Kentucky.—The Kentucky law prohibits the sale of seed of orchard-grass, Kentucky blue-grass, red clover and alfalfa, which has been misbranded or adulterated with certain other seeds with fraudulent intent.

Maine.—All seeds of agricultural plants must be labeled, showing the per cent of purity.

Wisconsin.—All flower, garden, vegetable or agricultural seeds must be labeled with the name, kind, year of growth and percentage of purity.

Iowa.—The seeds of all grasses and forage plants, flax, rape and cereals, must be labeled showing: (*a*) Name of the seed. (*b*) Name and address of the seedsman, importer, dealer or agent. (*c*) Percentage of purity of the seed, specifying the kind and percentage of certain impurities defined in the law, when the seeds fall below prescribed standards. (*d*) Date and place of growth.

The sale of seed containing seeds of the following plants is prohibited: Wild mustard, or charlock (*Brassica sinapistrum*), quack-grass (*Agropyron repens*), Canada thistle (*Cnicus arvensis*), wild oats (*Avena fatua*), clover and alfalfa dodder (*Cuscuta epithymum*), field dodder (*Cuscuta arvensis*), and corn cockle (*Lychnis githago*).

When seeds of one or more of the following plants are present in quantity exceeding a total of 2 per cent the approximate percentage of each must be indicated in the label: White cockle (*Lychnis vespertina*), night-flowering catchfly (*Silene noctiflora*), curled dock (*Rumex crispus*), smooth dock (*Rumex altissimus*), sheep sorrel (*Rumex acetosella*), yellow trefoil (*Medicago lupulina*), bur-clover (*Medicago denticulata*), sweet clover (*Melilotus alba* and *M. officinalis*), black mustard (*Brassica nigra*), plantain, buckhorn (*Plantago lanceolata*), bracted plantain (*Plantago aristata*), bindweed (*Convolvulus sepium*), smooth crab-grass (*Panicum glabrum*), common chickweed (*Stellaria media*).

Sand, dirt, chaff and foreign substances and seeds other than those given in the lists above, dead seed and broken seed, shall be considered as impurities, and, when present in amounts exceeding the prescribed standards of purity and germination, the name and approximate percentage of each shall be indicated in the label. Misbranding, as well as certain specific adulterations, are also prohibited.

This act does not apply to seed sold for food purposes, seed sold to merchants to be recleaned provided it is free from prohibited weed seeds, seed sold for export outside the state of Iowa, or seed sold by the grower on his own premises for seeding by the purchaser himself, but permits the sale of mixtures for lawn or pasture purposes without disclosing the names and proportions of the various seeds making up the mixture, provided the provisions of the law as to weed seeds are complied with.

The Iowa law, while one of the most recent, is the most comprehensive state seed law enacted, and its working will be closely watched.

The value of seed legislation.

Any seed legislation, to be of practical value, should be so drawn as not to interfere with the trade in the best quality of seeds, but place restrictions on the sale of low-grade seeds, and at the same time educate the purchaser by giving him definite information as to the quality of the seeds he is buying. This is now provided for, in Canada, by requiring no labels on seed free from weed seeds; and in Iowa, by requiring only a general label on seed free from weed seeds and complying with the standards set forth in the law, and by requiring other seeds to be fully labeled. In this way, the purchaser is fully informed as to the quality of all low-grade seeds purchased, and soon learns the folly of buying them.

The objection has been made to state legislation that it would tend to drive trade from any particular state, and this will doubtless be true until the state laws are made uniform, and these are supplemented by a federal law along similar lines.

Aside from any legislation, much good may be accomplished and the quality of agricultural seeds used in the United States may be greatly improved through the educational work done by the seed-testing laboratories of the state agricultural experiment stations and the United States Department of Agriculture.

LAWS FOR THE CONTROL OF PESTS AFFECTING AGRICULTURE

By *A. F. Burgess*

During the past half century, increasing attention has been paid by the general government and by the legislatures of the several states toward passing laws and appropriating money for the encouragement, promotion, and protection of agriculture. In the first years of this period, especial effort was made to awaken and interest the people in the possibilities of profit in growing crops on a more extensive scale. As a result, the farming lands of the West have been rapidly occupied by settlers, and, at the present time, the tendency is to subdivide many of the large farms. This has brought about the necessity for specialization in the production of crops, and it has become less feasible for the farmer to attempt to grow all kinds of produce. Transportation facilities have increased rapidly, in order to make it possible to move crops to the most desirable markets, and agricultural products are often shipped thousands of miles before reaching their final destination. New and improved varieties of seeds and plants are being secured from many foreign lands, and are delivered to remote parts of the United States in a relatively short time.

These factors furnish conditions particularly suited for rapid increase and easy dissemination of injurious insect pests and plant diseases. The average farmer, while he may be a specialist in growing the particular crop which he is accustomed to raise, has utterly failed, in many cases, to control outbreaks of these pests, and, as a result, the aggregate annual loss has been enormous. One of the difficulties in controlling successfully pests that have appeared, has been due to the fact that many of them were newcomers with which the farmer was unfamiliar; and in many cases it has been necessary for the entomologists or the plant pathologists carefully to work out the life history, observe the habits, and experiment extensively with different methods of treatment, before the grower could be advised as to the most satisfactory measures for preventing injury to his crops. The work of the agricultural experiment stations, which were founded and are largely maintained by the national government, and of the state entomologists throughout the country, has been of inestimable value in assisting the farmer to control these pests.

From 1880 to 1890, in spite of all efforts, the damage steadily increased, and the farmers and horticulturists of the country were beginning to awaken to the necessity of more effective measures of combating these troubles. In 1893, the San José scale, one of the most dreaded pests to horticulture, was found in an orchard in Virginia, and the following year outbreaks were reported in Maryland, New Jersey and Florida. This insect had been known in California since 1873, and had caused enormous damage to the fruit-growers. Many orchards were destroyed by its attacks, and, although its ravages were checked by thorough spraying and fumigation of the trees, the same treatment in the eastern states did not prove so effective. Recent investigations have proved that the insect is a native of North China, and that it was probably brought to this country on imported nursery stock.

The situation in the eastern and central states was very serious, owing to the fact that the small size of the insect rendered its detection by the horticulturist a very difficult matter until the trees were weakened by its presence, to the expense involved in thorough treatment, and to the lack of knowledge as to the best remedies to apply for its suppression. During the four years following the first discovery of this insect in Virginia, infested localities were found in many of the eastern states, and, as many thousands of trees were being destroyed, urgent appeals were made to the various state legislatures to enact suitable legislation to prevent the further introduction and spread of this insect. The laws considered were framed with special reference to the transmission of nursery stock, owing to the fact that shipments from infested nurseries were the principal means of starting new points of infestation.

The situation became so serious that early in 1897 a call was issued by the Ohio State Horticultural Society, to the horticultural and nursery interests of the United States, for a National Convention at Washington, D. C. It was held March 5 and 6 of that year, and was attended by delegates from state horticultural and agricultural societies, prominent nurserymen and economic entomologists. A bill was drafted to provide for the inspection of nursery stock passing into interstate commerce, and for the examination of stock which was received at ports of entry in the United States; the object being to prevent the spread of this and other injurious insects and diseases already established in this country, and to protect the farmer and the fruit-grower from importations from foreign lands which might at any time be received on imported stock. The bill drafted and accepted by this convention was not passed by Congress, and, as some nurseries which were known to be infested continued to sell and deliver stock in the states where no legislation prevented its sale or delivery, active work was begun in these states by the horticultural interests for the purpose of securing legislation for their protection. As a result, during the past ten years, laws have been enacted in nearly all the states and in Canada requiring state inspection of all nurseries and the certification of all stock shipped by them. In the main, this has proved a great help to the fruit-grower, the farmer, and the purchaser of trees and shrubbery. Nevertheless, the laws passed, although having the same purpose in view, have been of such diverse nature that many hardships have been experienced in transmitting stock from one state to another. The object of the section of the proposed national law concerning the inspection of imported nursery stock has not been attained, and the country is still in danger of receiving numerous foreign pests, as there is no adequate inspection to prevent their importation or distribution.

Summary of requirements for shipping nursery stock.

In order to give some idea of the complexity of the situation, a summary follows of the present requirements for shipping nursery stock into the states, provinces and territories of the United States and Canada:

Alabama.—The inspection work is in charge of the State Board of Horticulture. Persons shipping stock into the state must file a signed duplicate certificate of inspection, and obtain official tags, which must be placed on each shipment, in addition to a copy of the certificate. Cost of tags 60 cents per 100, or $2.25 per 1000. Five cents per 100 must be added for postage.

Arizona.—The University of Arizona Agricultural Experiment Station is authorized by law to inspect all palms and palm stock growing in or shipped into the territory. (Act of 1907.)

Arkansas.—Shipments must bear a certificate of inspection. (Act of 1903.)

California.—The enforcement of the Horticultural Law is lodged with the State Commissioner of Horticulture, who maintains a quarantine at the port of San Francisco and has general supervision of the enforcement of the law. Shipments of stock sent into the state are subject to inspection, and must bear the name of the consignor and consignee and a statement of where the stock was grown. Notice of shipments should be made to the Commissioner of Horticulture. A state quarantine has been declared against stock liable to be infested with the white fly, grown in infested sections of the southern states. Because of the danger of importing the Mexican cottonboll-weevil, cotton seed may be admitted only through the office of the State Commissioner of Horticulture in San Francisco and Sacramento, and through the Horticultural Commissions of El Centro, Imperial county, San Bernardino, San Bernardino county, Riverside, Riverside county, and San Diego, San Diego county. Seed being sent into the State must be forwarded to one of these Commissions, to be inspected or fumigated before being delivered to the owners for planting.

Colorado.—The State Board of Horticulture has general charge of the inspection law. Shipments into the state must be examined by county horticultural inspectors. (Amended Act of 1897.)

Connecticut.—Nursery and orchard inspection is conducted under the direction of the State Entomologist. Shipments of stock into the state must bear certificates of inspection, issued by a state or government officer, and a statement by the owner that they have been thoroughly fumigated. (Amended Act of 1903.)

Delaware.—The State Board of Agriculture has charge of the inspection of nursery stock. Shipments into the state must be accompanied by a certificate of inspection of a state or government official, and the owner or shipper must certify that the stock has been fumigated. Delaware nurserymen are required to fumigate their stock. (Amended Act of 1901.)

Florida.—It is unlawful for any non-resident person or persons, corporation or firm, to sell or offer for sale nursery stock in the state of Florida without first having paid a license tax of $25 annually to the Collector of Revenues of the county in which the stock is sold or offered for sale. On payment of this amount, a license will be issued by the county judge. (Act of 1905.) It is unlawful for any person knowingly to sell or give away diseased nursery stock or seeds in the state of Florida. (Act of 1906.)

Georgia.—Nursery and orchard inspection is in charge of the State Board of Entomology, which has authority to make regulations which have the force of law. Stock shipped into the state must be accompanied with certificates of inspection and copies of the official tags of the State Board of Entomology. These may be obtained by submitting a duplicate of the official certificate of inspection and a statement that all stock shipped into the state will be properly fumigated. Tags are furnished at cost. (Act of 1900.)

Hawaii.—Shipments are subject to the regulations of the Board of Commissioners of Agriculture and Forestry, and are subject to inspection and quarantine on arrival at Honolulu, which is the only port where they are allowed to be landed.

Idaho.—Persons desiring to sell or ship stock into this state must file a bond in the sum of one thousand dollars ($1,000) with the State Board of Horticulture, conditioned on the faithful compliance with the requirements of the law, and secure a permit to do business in the state. Shipments must bear official certificates of fumigation, and the name of the grower and consignee must appear on the package.

Illinois.—The horticultural inspection law is enforced by the State Entomologist. Shipments into the state must be accompanied by certificates of inspection. The State Entomologist is required by law to furnish annually to Illinois nurserymen a list of state and government inspectors whose certificates may be received as equally valid with his own, and the nurserymen receiving stock under such certificates are authorized to substitute the Illinois certificate of inspection. Agents and dealers must file sworn statements with copies of certificates, showing the source from which their stock is obtained, for the approval of the State Entomologist. (Act of 1907.)

Indiana.—Nursery and orchard inspection is placed by law under the direction of the State Entomologist. Stock shipped into the state must be accompanied with certificates of inspection, and each shipment must bear the name of the consignor and consignee. It is unlawful for any transportation company to accept for shipment or to deliver any uncertified nursery stock. (Act of 1907.)

Iowa.—The State Entomologist has charge of nursery and orchard inspection. Shipments into the state must be accompanied by official certificates of inspection, copies of which should be previously filed for approval with the State Entomologist. (Amended Act of 1906.)

Kansas.—The State Entomological Commission has charge of the inspection of nurseries and orchards. Stock shipped into the state must be accompanied by certificates of inspection. (Act of 1907.)

Kentucky.—The inspection of nurseries and orchards is conducted by the State Entomologist. Shipments into the state must be accompanied by official certificates of inspection, copies of which should be filed with the State Entomologist. (Act of 1897.)

Louisiana.—The State Crop Pest Commission has charge of nursery and orchard inspection, and the investigation of outbreaks of insects, pests and plant diseases. Shipments sent into the state must be accompanied with official certificates of inspection. When a shipment containing two or more orders is sent to an agent or dealer for delivery to different persons, a certificate must accompany each individual order. (Act of 1903, Regulations of State Crop Pest Commission, approved, April 11, 1907.)

Maine.—Inspection for injurious insect pests is in charge of the Commissioner of Agriculture. Shipments into the state must bear official certificates of inspection or affidavits that the contents have been fumigated in a manner approved by the State Inspector at the shipping point. (Act of 1908.)

Maryland.—The law places inspection of nurseries and orchards in charge of the State Entomologist and Plant Pathologist of the Maryland Agricultural Experiment Station. Stock sent into the state must bear the name of the consignor and consignee and a certificate of inspection. Duplicate certificates should be filed with the State Entomologist. (Act of 1898.)

Massachusetts.—The enforcement of the law is in charge of the State Nursery Inspector, who is appointed by the State Board of Agriculture. Stock sent into the state must bear a certificate of inspection or an affidavit of fumigation. (Amended Act of 1907.)

Michigan.—The inspection of nurseries and orchards is conducted by a State Inspector appointed by the State Board of Agriculture. Nurserymen selling stock in this state must pay a license fee of five dollars ($5.00) and furnish bond of one thousand dollars ($1,000) with satisfactory sureties. Shipments must be accompanied with certificates of inspection and, if of species subject to attack of the San José scale, certificates by the nurserymen that the stock has been properly fumigated. (Amended Act of 1905.)

Minnesota.—The State Entomologist has charge of the inspection of nurseries. Stock shipped into the state must bear a certificate of inspection. (Act of 1903.)

Mississippi.—The Entomologist of the Mississippi Experiment Station is given authority by law to make such regulations as may be deemed necessary to prevent the introduction of dangerous pests and secure the control of those already established in the state. Before shipping stock into the state, a copy of an official certificate of inspection must be filed with the Entomologist of the Agricultural Experiment Station, which must state that, in addition to the regular inspection, the stock has been fumigated under the direction of the official issuing the certificate. Failure to comply with this requirement renders stock liable to confiscation and destruction. All shipments must be accompanied by such a certificate. (Act of 1908.)

Missouri.—The law requires that stock shipped into the state must bear the name of the consignor and consignee, and a statement of contents and an official certificate of inspection.

Montana.—The State Board of Horticulture has charge of the Horticultural Law in this state. Its regulations require that all stock brought into the state must be unpacked, inspected, and, if necessary, fumigated at one of the designated quarantine stations, viz., Miles City, Billings, Dillon, Missoula, Kalispell, Great Falls, Troy, Plains, Glasgow, or Thompson Falls. Nursery stock may be inspected and, if necessary, fumigated, at other points of delivery on payment of all cost. To sell or deliver nursery stock, it is necessary first to obtain a license by paying a fee of twenty-five dollars and by filing with the Secretary of the State Board of Horticulture a bond in the sum of one thousand dollars ($1,000) annually. Notice of shipment, including an invoice of stock, must be sent to the Secretary of the State Board of Horticulture, Hirbour Block, Butte, Montana. (Act of 1899.)

Nebraska.—No nursery-inspection law. Local nurseries inspected and certificates issued by the State Entomologist.

Nevada.—No law.

New Hampshire.—The inspection law is enforced by the State Entomologist. Stock shipped into the state must bear a certificate of inspection, or a statement containing an affidavit that it has been properly fumigated. (Act of 1903.)

New Jersey.—The State Entomologist is charged with the enforcement of the nursery-inspection law. Stock shipped into the state must be accompanied with a certificate of inspection and a statement from the shipper that it is a part of the stock inspected, and whether it has been fumigated with hydrocyanic acid gas. (Act of 1903.)

New Mexico.—No law relating to nursery inspection. Orchard inspection is conducted under the direction of county boards of horticultural commissioners.

New York.—Nursery and orchard inspection is conducted under the direction of the Commissioner of Agriculture. Nursery stock shipped into the state must be accompanied with an official certificate of inspection, and must be fumigated before being sold or planted. (Act of 1903.)

North Carolina.—Shipments sent into this state must bear official certificates of inspection and should be fumigated, and a statement to that effect signed and attached by the consignor. Duplicate certificates must be filed with the State Entomologist. (Act of 1897.)

North Dakota.—No law.

Ohio.—Nursery and orchard inspection is in charge of a Chief Inspector appointed by the State Board of Agriculture. Shipments must be accompanied with official certificates of inspection or fumigation. Agents and dealers must file sworn statements as to sources from which their stock is obtained.

Oklahoma.—The owners or operators of nurseries who desire to ship stock into the state of Oklahoma are required to make an application for a permit. This will be issued by the Board of Agriculture on the filing of a duplicate certificate of inspection or the report of inspection from the State Inspector who examined the stock. The application must be accompanied by a remittance of $5. In addition, the Board may require further evidence of integrity to establish the responsibility and good faith of the applicant. If satisfactory, the Board will issue a permit over the signature of its Secretary. All shipments must be accompanied by a tag on which is printed a copy of this permit over the facsimile signature of the Secretary of the Board. All agents canvassing for nurseries located outside the state are required to carry a duplicate of the permit of their principal, which duplicate is issued on payment of one dollar ($1). Quotations on tags will be forwarded on application to the Secretary. Address all communications to Oklahoma State Board of Agriculture. (Act of 1905.)

Oregon.—Inspection of nursery stock is in charge of the State Board of Horticulture. All stock from outside the state is subject to inspection on arrival at quarantine stations. (Amended Act of 1905.)

Pennsylvania.—Shipments of nursery stock into the state must be plainly labeled on the outside with the name of the consignor and consignee, and a certificate showing that the contents have been inspected and that the stock (excepting conifers and herbaceous plants) therein contained has been properly fumigated. Dealers in nursery stock are furnished certificates under certain restrictions. Transportation companies are required to reject all stock entering the state, unless certificates of inspection and fumigation are attached. (Act of 1905.)

Porto Rico.—Nursery stock will be received only through three ports of entry, namely, San Juan, Ponce, and Mayaguez, and must be accompanied with an official certificate of inspection. It is subject to inspection by local inspectors on arrival at said ports of entry. Inspectors are appointed by the Governor. (Act of 1905.)

Rhode Island.—The State Nursery Inspector is appointed by the State Board of Agriculture. He also has charge of the supervision of gypsy and brown-tail moth work. Shipments of nursery stock must be accompanied with certificates of inspection or affidavits of fumigation. (Act of 1904.)

South Carolina.—A duplicate certificate of inspection must be filed with the State Entomologist and an official tag of the State Board of Entomology secured by nurserymen desiring to ship stock into the state. This tag and an official certificate of fumigation must be attached to all shipments. (Act of 1903.)

South Dakota.—The nursery-inspection work is in charge of the State Board of Agriculture. Shipments into the state must be accompanied with official certificates of inspection. A license fee of ten dollars ($10) must be paid to secure a permit to ship stock into the state. (Act of 1907.)

Tennessee.—A certificate of inspection, signed in person by the Inspector or the State Entomologist, must be filed in the office of the Tennessee State Board of Entomology, Knoxville, Tenn., previous to all shipments. All nursery stock must be fumigated, and a tag indicating the same placed on each shipment. (Act of 1905.)

Texas.—Duplicate certificates of inspection must be filed, and all shipments must bear certificates of inspection. (Act of 1905.)

Utah.—The State Board of Horticulture has charge of the inspection of nursery stock. All stock shipped into the state must bear an official certificate stating that it has been fumigated with hydrocyanic acid gas. Nurserymen doing business in the state must pay a license fee and file a bond with the State Board of Horticulture in the sum of $500. License fees are graded as follows: Any annual business of below one thousand dollars ($1,000), five dollars ($5) per year; over one thousand dollars ($1,000) and under three thousand dollars ($3,000), ten dollars ($10) per year; over three thousand dollars ($3,000) and under ten thousand dollars ($10,000), twenty-five dollars ($25) per year; over ten thousand dollars ($10,000), fifty dollars ($50) per year.

Vermont.—No law.

Virginia.—The Board of Control of the Agricultural Experiment Station is constituted by law, the State Board of Crop Pest Commissioners, who are empowered to make such regulations as they may deem necessary to control the serious insect pests and plant diseases in the state. The Board is authorized to appoint a State Entomologist to enforce the inspection law and the rules and regulations of the Board. Duplicate certificates of inspection must be filed by nurserymen shipping stock into the state, and official tags obtained from the Board of Crop Pest Commissioners; also a registration fee of twenty dollars ($20) must be paid. Tags are furnished at cost. (Amended Act of 1903.)

Washington.—The State Board of Horticulture has charge of the enforcement of the horticultural law of the state. Before soliciting or engaging in selling nursery stock in this state, a bond of one thousand dollars ($1,000) and a license fee of five dollars ($5) must be paid by nurserymen, and a license fee of two dollars and fifty cents ($2.50) by agents and dealers. Notice must be sent previous to the shipment of stock, giving the names of the nurserymen and the places at which it is to be delivered. (Act of 1907.)

West Virginia.—The Director of the Agricultural Experiment Station is charged with the enforcement of the inspection law of the state. All stock shipped into the state must be accompanied by an official certificate of inspection and fumigation. Notice of shipments must be sent ten days before the time of delivery to the Director of the West Virginia Experiment Station, stating the number of trees in each consignment, the place from which such are to be shipped, and their destination. Agents and dealers who sell stock must secure a license from the assessor in the county where the stock is sold, and pay a fee of ten dollars ($10) to the sheriff of the county. (Amended Acts of 1905 and 1907.)

Wisconsin.—The Director of the Agricultural Experiment Station, in person or through his agent, has charge of the inspection work in the state. Stock shipped into the state must be accompanied by an official certificate of inspection. (Act of 1907.)

Wyoming.—The horticultural inspection law is enforced by the State Board of Horticulture. Any person or firm wishing to do business in the state must first secure a license. Licenses are issued on application, for a period terminating on July 1, or the next succeeding inspection year (approximately two years). All applications must be accompanied by the license fee ($25), a bond in the sum of five hundred dollars ($500), conditioned that the principal will faithfully obey the law of the state of Wyoming, and by a certified certificate of inspection from an authorized inspector in the state from which shipments are to be made. On receipt of these, the Secretary of the State Board issues authorized shipping tags (at cost) Nursery stock may not enter the state, and transportation companies may not deliver, unless such tags be attached to each and every box, bundle, or bale. (Act of 1905.)

Canada.—Shipments of stock into Canada are unpacked and fumigated by government inspectors and must arrive, within the time specified, at the following ports of entry: St. John's, Quebec; Niagara Falls, Ont., and Windsor, Ont., from March 15 to May 15, and from September 26 to December 7; St. John, N. B., and Winnipeg, Man., from March 15 to May 15, and from October 7 to December 7; Vancouver, B. C. from October 1 to May 1.

The outlook.

A somewhat detailed account has been given of the legislation which was brought about as a result of the damage caused by the San José scale. While it is true that conditions have been gradually changing since legislation of this kind was first enacted, the whole course of events has shown what may again take place if some new pest should appear which would not yield readily to the control measures now used, and thereby seriously threaten any branch of agricultural industry. The work is now being done under different managements in each state, and it would be possible to take up control measures more easily by using the machinery for this purpose already organized; still it is probable that requirements for interstate shipments would be as diverse as they are at present, which would make the situation complicated in the extreme.

It is a well-known legal fact that no state can lay a burden on interstate commerce, but it is also recognized that every state has a right to refuse the delivery of goods or property which it may deem dangerous to the health or welfare of its citizens. The enactment of state inspection laws appears to reflect the attitude of the different states in regard to their willingness to accept stock which has been inspected and certified to by the officials of another state. On the one hand, we find a series of laws so framed that the official inspector must accept a valid certificate from another state, with the very reasonable provision that he may examine any shipments which he has reason to think are infested or infected with dangerous pests; while, on the other hand, we find laws so framed that the inspector is required to examine all stock coming into the state and satisfy himself that it is in good condition before allowing it to be delivered. Between these two types of laws will be found almost every variation or combination of requirements which it is possible to make, and this is largely responsible for the difficulty which has been encountered in making interstate shipments.

In some states, the inspections are made by county inspectors, and in California and some of the western states every county forms an integral unit which may quarantine against not only other states but other counties in the same state. The general trend of legislation and requirements, in recent years, has been to increase, rather than to diminish, the difficulty of making shipments.

For the past two years, the Association of Economic Entomologists and the Association of Horticultural Inspectors of the United States have been endeavoring, in coöperation with the American Association of Nurserymen, to devise some scheme by means of which the situation could be relieved and all interests receive reasonable protection. The first-mentioned bodies have expressed themselves through resolutions as favorable to a national law for the inspection of shipments received from foreign countries and those passing into interstate commerce, as this was considered the most feasable way to secure uniformity. Such horticultural interests as have considered the matter have expressed themselves as favorable to the plan outlined by the entomologists and inspectors. The Nurserymen's Association at a recent convention expressed itself as unfavorable to national control and adopted a resolution favoring an effort toward uniformity of inspection by the state officials.

In considering the whole problem in a broad way, it is apparent that vigorous action should be taken to prevent the introduction of injurious pests from abroad. The destruction worked by the gypsy and brown-tail moths in New England, which is costing the citizens of the states concerned and the general government approximately $1,000,000 annually besides the loss of thousands of trees and hundreds of acres of forest, the immense damage sustained by the farmers of the South due to the introduction of the Mexican cottonboll-weevil, and the continued danger of the introduction of other equally serious pests, demands that some system be put into operation whereby the further introduction of destructive pests may be prevented.

The state of California for years has maintained a quarantine office at the port of San Francisco, and, as a result of the examinations, many serious pests have been prevented gaining a foothold in that state. This work should be extended to other ports of entry, and it seems only reasonable and proper that, for the purpose of securing uniform and efficient administration, it should be conducted by the national government.

An act to control shipment of living insects.—A law was passed by Congress and approved March 3, 1905, relative to shipping living insects into the United States and also into interstate commerce. It is as follows:

An Act to prohibit importation or interstate transportation of insect pests, and the use of the United States mails for that purpose.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That no railroad, steamboat, express, stage, or other transportation company shall knowingly transport from one State or Territory into any other State or Territory, or from the District of Columbia into a State or Territory, or from a State or Territory into the District of Columbia, or from a foreign country into the United States, the gypsy moth, brown-tail moth, leopard moth, plum curculio, hop plant-louse, boll-weevil, or any of them in a live state, or other insect in a live state which is notoriously injurious to cultivated crops, including vegetables, field crops, bush fruits, orchard trees, forest trees, or shade trees; or the eggs, pupæ, or larvæ of any insect injurious as aforesaid, except when shipped for scientific purposes under the regulations hereinafter provided for; nor shall any person remove from one state or Territory into another State or Territory, or from a foreign country into the United States, or from a State or Territory into the District of Columbia, or from the District of Columbia into any State or Territory, except for scientific purposes under the regulations hereinafter provided for, the gypsy moth, brown-tail moth, leopard moth, plum curculio, hop plant-louse, boll-weevil, or any of them in a live state, or other insect in a live state which is notoriously injurious to cultivated crops including vegetables, field crops, bush fruits, orchard trees, forest trees, or shade trees; or the eggs, pupæ, or larvæ of any insect injurious as aforesaid.

Section 2. That any letter, parcel, box, or other package containing the gypsy moth, brown-tail moth, leopard moth, plum curculio, hop plant-louse, boll-weevil, or any of them in a live state, or other insect in a live state which is notoriously injurious to cultivated crops, including vegetables, field crops, bush fruits, orchard trees, forest trees, or shade trees, or any letter, parcel, box, or package which contains the eggs, pupæ, or larvæ of any insect injurious as aforesaid, whether sealed as first-class matter or not, is hereby declared to be nonmailable matter, except when mailed for scientific purposes under the regulations hereinafter provided for, and shall not be conveyed in the mails, nor delivered from any post-office nor by any letter-carrier, except when mailed for scientific purposes under the regulations hereinafter provided for; and any person who shall knowingly deposit, or cause to be deposited, for mailing or delivery, anything declared by this section to be nonmailable matter, or cause the same to be taken from the mails for the purpose of retaining, circulating, or disposing of, or of aiding in the retention, circulation, or disposition of the same shall, for each and every offense, be fined, upon conviction thereof, not more than five thousand dollars or imprisoned at hard labor not more than five years or both, at the discretion of the court: Provided, That nothing in this Act shall authorize any person to open any letter or sealed matter of the first-class not addressed to himself.

Section 3. That it shall be the duty of the Secretary of Agriculture, and he is hereby authorized and directed to prepare and promulgate rules and regulations under which the insects covered by sections one and two of this Act may be mailed, shipped, transported, delivered, and removed for scientific purposes, from one State or Territory into another State or Territory, or from the District of Columbia into a State or Territory, or from a State or Territory into the District of Columbia, and any insects covered by sections one and two of this Act may be so mailed, shipped, transported, delivered, and removed, for scientific purposes, under the rules and regulations of the Secretary of Agriculture: Provided, That the rules and regulations of the Secretary of Agriculture, in so far as they affect the method of mailing insects, shall be approved by the Postmaster-General, and nothing in this Act shall be construed to prevent any state from making and enforcing laws in furtherance of the purposes of this Act, prohibiting or regulating the admission into that State of insects from a foreign country.

Section 4. That any person, company, or corporation who shall knowingly violate the provisions of section one of this Act shall, for each offence, be fined, upon conviction thereof, not more than five thousand dollars or imprisoned at hard labor not more than five years, or both, at the discretion of the court.

Whether this law is broad enough to meet the demands of the situation must be determined by competent legal authority. It is obvious, however, that little permanent good can result from its enactment unless a suitable appropriation is made for its execution.

The situation, at present, is such that every reasonable effort should be made to curtail the damage resulting from the transmission of dangerous pests and to prevent their further introduction. The

Plate XXIII. Ontario Agricultural College, Guelph. Top, Macdonald Hall; center, campus; bottom, Macdonald Institute.

amount of money necessary to establish such safeguards would be small in comparison with the benefits which would accrue to the agriculturist and to the general public.

WEED CONTROL AND WEED LEGISLATION

By *George H. Clark*

It is difficult accurately to estimate the net losses to individual farmers, or to a country as a whole, from the prevalence of vigorous-growing plants that are positively injurious to crops. The productive capacity and net returns from farm lands may represent their value to be seventy-five dollars per acre, which value, within two or three years, may be reduced one-half because of the losses sustained through noxious weeds and the cost of labor entailed for combating them; nor is it possible at all times for the farmer entirely to free himself from such losses, unless he is able to secure the coöperation of all the farmers in the community where he lives, from one or more of whose lands the difficulty for the whole community may arise.

Regulations respecting the destruction of weeds.

Regulations respecting the destruction of weeds, in order to attain the purpose for which they are made, must be supported by the general sentiment of the people in the district or community where they are to be administered. To secure that support, the provisions of weed laws and the administration thereof must be entirely practicable from the viewpoint of the farmers in general who are affected by those laws. Some of the state or provincial weed laws,that have been framed or enacted with the best intentions, have proved to be only partially effective, because proper provision was not made to secure their observance, or because their enforcement was impracticable and supported in a few localities only.

It is because many kinds of vigorous-growing, worthless plants tend to spread rapidly, either naturally or by the aid of man—very often unwittingly—that regulations respecting the control or destruction of weeds become necessary to the welfare of the community as a whole. When made to apply to a wide range of conditions of soil and climate, weed laws are necessarily limited in their scope, so far as their application to named weeds is concerned. There are some plants which are known to be noxious under a wide range of climatic and soil conditions, but many of the weeds that are most harmful in some districts may be relatively or entirely harmless in a different climate or soil.

Laws that are intended to control or exterminate noxious plants are usually framed with a view to suppress their distribution. Investigation has shown the commerce in seeds and grain to be an exceedingly fruitful medium of distribution, from district to district, of many kinds of weeds. It is of primary importance that governing bodies, having the power to exercise control over commerce in grain and seeds, should make and secure the enforcement of regulations to protect the best interests of agriculture, so far as possible, without unduly hampering trade, against gross evils that are known to be connected with the trade in agricultural seeds and the feeding-stuffs or other by-products from commercial grain. Such legislation on the part of the federal governing body might do well to confer on minor governing bodies the power to work out and apply the details of the law, especially in respect to defining the noxious plants that are to be legislated against; which details would vary considerably, because of the different soil or climatic conditions of the various districts where the law is to be administered.

The problem of whether farmers should be deprived of the privilege of knowingly purchasing for their own use seeds that are foul with noxious weed seeds may properly be considered from the standpoint of the extent to which such farmers are introducing a nuisance in the communities where they live. The principal object of the legislation should be to prevent misrepresentation on the part of unscrupulous seed vendors in the sale of seeds, the real quality of which may be difficult to judge by appearance except by an expert.

Canadian Seed Control Act.

The Seed Control Act of Canada fixes a definite standard of quality, in respect to both purity and germination, for grass and clover seeds that may be graded No. 1, or by any other designation representing the seeds to be of first quality. A minimum standard of quality in respect to weed seeds is specified in the act, below which seeds are not permitted to be sold for seeding. Seed vendors are compelled by the act to label sacks of seed grain, clearly showing the kinds, if any, of the noxious weed seeds contained by the seed that is offered for sale. The act places no restriction on either the import or the export trade. Many kinds of weeds, such as dodder, that are noxious abroad are relatively harmless in Canada, and some kinds that give trouble in Canada are comparatively harmless in the countries to which Canadian seeds are largely exported.

An official seed analyst and a staff of expert seed inspectors are charged with the duty of securing the observance of the provisions of the act. It is, however, the privilege of any person to enter prosecutions under the act. The certificate of the official seed analyst is accepted as *prima facie* evidence before a court. In practice, all statements of complaint are filed and prosecutions instituted by official seed inspectors, the object of such prosecutions being to secure the mark of condemnation of the court on persons or firms guilty of wanton carelessness or contrivance to evade the provisions of the act. It is not to be expected that the press will make use of such court proceedings against their advertising patrons, and when necessary to secure publicity, as a more effective punishment, the information is presented in governmental publications.

Three years' application of the Seed Control Act of Canada may fairly be said to have eliminated the importation of seed cleanings and low-grade grass and clover seeds; depreciated the price paid to farmers for seeds grown on lands that are foul with noxious weeds, and increased the prices for clean seed of good quality, provided a large measure of protection to honorable legitimate seedsmen against sharp practices in competition, on the part of unscrupulous seed vendors; stimulated to the installation and more general and thorough use of the best modern apparatus for cleaning and testing seeds in seed-houses; provided the means by which purchasers of seeds, who are desirous of helping themselves, may buy intelligently, and thus protect their lands from the introduction of noxious weeds; and removed one of the principal objections to the making and enforcing of provincial or municipal laws respecting the destruction of noxious weeds.

Destruction of noxious weeds.

Legislation respecting the destruction of noxious weeds, for the purpose of suppressing their distribution or exterminating them, has been enacted by many of the provinces, states and territories in North America. It would seem that the strict observance of these laws has been the exception rather than the rule. All of them, however, have no doubt been of some benefit as an educational factor; and, although some of them are declared by farmers to be impracticable, or are not enforced, they outline a condition of things that is condemned by a law which may be put into operation at any time.

The Noxious Weed Ordinance of the provinces in the west of Canada defines the species of weeds that are included in the application of the law. Section 4 of the act for the province of Saskatchewan: "Every owner or occupant of land should destroy all noxious weeds thereon, and if he make default in so doing he shall be guilty of an offence, and on prosecution thereof by an inspector, overseer or other officer under the Ordinance, shall on summary conviction thereof, be liable to a penalty not exceeding $100."

A chief inspector of weeds, and, under his direction, numerous local weed inspectors, are appointed under the Ordinance. In practice, they administer the law with a great deal of discretion, and secure its observance largely by persuasion, resorting to the courts only in case of stubborn resistance. The economic benefit of the Ordinance is fully recognized, and the law is supported by the farmers as a whole.

The municipal governing bodies of the province of Manitoba are required by the Noxious Weed Law of that province, under penalty of a fine which may be imposed on its individual members, to appoint a weed inspector for the municipality, who is charged with the administration of the act and who is also subject to punishment by fine for neglect to perform any duty placed on him by the act.

The framing of laws with a view to control or suppress noxious weeds is fittingly treated in Bulletin No. 17, Division of Botany, United States Department of Agriculture (quoted below). This bulletin also gives the weed laws in the various states, and should be consulted for such information. There is abundant evidence of the need for the suppression of weeds by concerted action on the part of the farmers as a whole, especially in those districts that are given largely to the production of cereal crops. Much can be done, through well-directed efforts and wise and efficiently administered regulations, to increase immensely the fruits of labor applied to the land, through enforcing the suppression not only of those noxious plants that are commonly called weeds but also of those injurious fungous plants which are only vaguely understood by most farmers, but which cause untold losses in diseases of their field and garden crops. The making of laws respecting noxious weeds should be preceded by, distinctly supplementary to, and administered conjointly with, vigorous continued educational work, in the rural school, field meetings of farmers when weeds are most in evidence, short courses and college-extension work, and in well-illustrated literature.

Essential provisions of a general state weed law.

A study of the methods by which weeds may be eradicated, together with a consideration of existing laws and the circumstances under which such laws must be carried out, affords ground for the suggestion of certain provisions which may form the basis of a general state weed law. The weed law here proposed has been carefully revised by a jurist familiar with the legal usages and constitutional requirements. [Adapted from Bulletin No. 17, Division of Botany, United States Department of Agriculture, "Legislation Against Weeds," by Lyster H. Dewey.]

AN ACT for the extirpation of such weeds as are most injurious to the interests of the farming community of the State of ——— or Territory of ———.

Be it enacted, etc.:

Section 1. A permanent commission to be known as the State Weed Commission is hereby created, to consist of the State botanist *ex officio* [or similar State officer] and four eminent farmers who have a fair knowledge of the botany of the State, who shall be appointed and commissioned by the governor, by and with the advice and consent of the senate, and shall hold their offices for a term of ——— years, respectively, or until their successors are appointed. The governor shall have power to fill all vacancies that may happen in the commission during the recess of the senate by granting commissions which shall expire at the end of its next session.

Sec. 2. Said commission shall meet annually at the seat of government on the first Monday of ——— and be in session for a period not exceeding ——— days; and for such service each commissioner who is not a salaried officer of the State shall be entitled to be paid ——— dollars a day for each day's actual attendance at the annual session, and mileage at the rate of ——— cents a mile for his time and expenses in traveling from the place of his abode to the place of holding the session, and the same rate returning therefrom to the place of his abode, to be computed by the usual route of travel. Said compensation and the necessary expenses of the commission for stationary, printing, and postage shall be paid by the State treasurer out of any moneys in the treasury, not otherwise appropriated, upon vouchers issued by the secretary of the commission and approved by the chairman.

Sec. 3. The governor shall when necessary assign a room at the State Capitol for the use of the commission in which to hold its annual sessions. Three commissioners shall constitute a quorum. The State botanist [or similar State officer] shall be custodian of the records, and, when present, be chairman of the commission.

Sec. 4. Said commission or a majority thereof, shall determine during its first session what species of weeds, not exceeding five in number, are most injurious to the interests of the farming community, and shall prepare a list thereof to be known as Schedule A of this act, which shall state the common and technical names of such weeds and the time or times of year at which they can be most advantageously destroyed, and shall also contain a concise description of the best economical methods for their destruction. And said schedule may thereafter be modified at any annual session of the commission by a majority thereof; *Provided*, That not exceeding the above number of species of weeds shall be included in any annual schedule.

[New weeds are being introduced and in some cases old ones are becoming less troublesome. Therefore frequent changes will be found necessary for the best results, and the list should be so arranged that the changes desired can be readily made. When a new weed is introduced it is often important that it be proscribed at once without waiting for the legislature to act. Both the common and the technical names of the weeds to be destroyed should be given. The technical names are necessary since the common names are not sufficiently definite, one common name often referring to two or more species, or one plant being known by different names in different parts of the same state. As different species of weeds produce seeds at different seasons and the same species often matures at different dates in different parts of the same state, it is evidently impossible to specify the best dates for the destruction of all weeds in all parts of the state in the general law.]

5. When at its first session, or at any annual session thereafter, the commission shall have adopted a schedule or shall have modified one previously adopted, as above provided for, it shall be the duty of the chairman to have a sufficient number of copies of this act with such schedule annexed printed and distributed by mail in the following manner: one copy to each State, county and township officer, and one copy to each daily and weekly newspaper published within the State; and the schedule so adopted or modified shall be published in the same manner as the public statutes are published.

Sec. 6. It shall be the duty of every owner, lessee, or occupier of land in this State, and of every owner, lessee, or occupier of any city, town, or village lot, upon whose land or lot any of the weeds named in the schedule provided for in this act shall be found growing, to destroy the same or cause them to be destroyed at or before the time or times mentioned in said schedule and in the mode therein described, or in such other manner as shall absolutely prevent the ripening and spread of their seed.

Sec. 7. The board of supervisors in each county in this State shall on the first Monday of ——— in each year appoint one weed inspector for each township or election district in their county, who shall qualify and hold office until his successor is appointed and qualified. It shall be the duty of each weed inspector to inspect or upon the approval of the board of supervisors, employ assistants and have inspected all lands or lots within his election district within three days succeeding the expiration of the time or times mentioned in Schedule A for the destruction of weeds; and if any weeds specified in the said schedule are found on any such land or lots the inspector shall notify the owner thereof in writing to destroy them; and if the weeds are not destroyed within five days after the service of notice the weed inspector shall employ labor, if necessary, and enter the lands and destroy or cause to be destroyed in the most practical and economical manner [or in the manner prescribed in the schedule] all of the weeds mentioned in said schedule.

[In states where an annual inspection of the land is impracticable sections 7 and 8, as found on next page, may be substituted for the corresponding sections here given. For thickly settled farming communities, and especially for cities and villages, an annual inspection is strongly recommended.]

Sec. 8. Each weed inspector designated in section 7 shall make an itemized statement, duly verified by oath or affirmation, of the expenses incurred in inspecting each tract of land or lot and for all expenses incurred by him for destroying weeds found thereon, which statement shall contain a description, sufficient for identification at the office of the county assessor, of each tract of land or lot on which such weeds were destroyed under his direction, together with the name of the owner or occupier of said tract of land or lots; and he shall deliver each such statement to the county assessor and a certified copy thereof to the county auditor. He shall also issue vouchers for himself and for each assistant employed in inspecting weeds at the rate of —— per day and to each laborer employed in destroying weeds at the rate of —— per day for the time actually employed. These vouchers shall be presented to and audited by the county auditor who shall indorse thereon the amount he finds due, and then they shall be returned to the payee named therein or his assigns or legal representatives and paid by the county treasurer out of any moneys not otherwise appropriated, or be receivable for county taxes within the county in which they were issued to the amounts indorsed thereon by the auditor.

Sec. 9. The county assessor shall assess as a special tax on each lot or parcel of land on which weeds have been destroyed by the inspectors as above directed the amount of expenses incurred for inspection and in the destruction of the weeds as set forth on the verified expense statement received from the inspector. Said taxes shall be collected in the same manner and with like penalties as other county taxes are collected *Provided, however*, That the owner, lessee, or occupier of any land or lot in respect to which any such expense statement has been issued, may deposit the amount payable thereon, with the county treasurer, and in each such case it shall be the duty of the treasurer to receive the same and give notice of the payment to the assessor.

Sec. 10. The State Weed Commissson shall have power to prepare and issue all necessary printed forms, notices, and instructions tending to secure uniformity in the appointment of weed inspectors, employment of labor, statements of expenses, and the rendering of reports.

Sec. 11. Each weed inspector shall in December of each year mail to the State botanist a report in the prescribed form, stating approximately the number of acres in his district on which weeds of each species mentioned in Schedule A were destroyed under his direction during the preceding part of the year, the total cost of destroying them, and the cost of inspecting the land in his district. The State botanist shall present to the governor on the first Monday of February in each year a report of the proceedings of the commission together with a statement of its expenses and of the total expenses by counties of inspecting land and destroying the weeds thereon during the preceding year and of the total number of acres in each county on which weeds have been destroyed as required by this act. And it shall be the duty of the governor to submit said report to the State legislature, if then in session, or within the first week of its next regular session.

Sec. 12. The willful resistance to or wrongful interference with any weed inspector or assistant or laborer employed by any weed inspector, while in the performance of any of the duties in this act prescribed, is hereby declared a misdemeanor punishable by fine not exceeding —— dollars or imprisonment not exceeding —— days, or both, in the discretion of the county court, and the county courts are hereby given jurisdiction of all such offenses.

Sec. 13. The words "owner, lessee, or occupier" wherever used in this act shall include corporations, companies, associations, or agents owning, holding, occupying, or responsible for the use or care of any lot or land within the limits of this State, and they shall be subject to all the provisions of this act in the same manner and with like liabilities as any other owner, lessee, or other occupier of lands or lots, and service of notice upon any agent or officer of any such company, corporation, or association shall constitute service upon said company, corporation, or association.

Sec. 14. It shall be the duty of the highway commissioner or other officer directly responsible for the care of public highways in each township or county in this State to destroy or cause to be destroyed all weeds mentioned in Schedule A on the highways within his district, at or before the times mentioned in said schedule and in such manner as to effectually prevent the production of their seeds. He is hereby directed to warn out labor or employ labor for this purpose in the same manner as for repairs to the highway, and for neglect or failure to perform this work he shall be subject to the same penalties as for the neglect or failure to perform duties pertaining to the repair of highways.

Sec. 15. The State Weed Commission shall prepare a plan for the eradication of weeds mentioned in Schedule A found growing on lands belonging to the State and also on lands within the State the title of which still remains in the Federal Government, and shall report the same to the governor to be by him transmitted to each branch of the legislature during the first week of the next regular session of the legislature.

Sections 7 and 8 as here given are offered as substitutes for sections 7 and 8 on page 535, for states where an annual inspection of all the lands is regarded as impracticable:

Sec. 7. In case of the neglect or failure of any owner, lessee, or occupier of any land or lot within this State to destroy thereon the weeds mentioned in Schedule A at or before the times mentioned in said schedule, any person owning or having in charge any land or lot within the same township may complain in writing,—stating the names of the weeds, the location of the land, and the name of the owner, to the highway commissioner or street commissioner or other officer having in charge the highways or streets of the township, village or city within which the weeds complained of are growing. In every such case the complainant shall send with his complaint a written agreement to pay to the said highway commissioner or other officer above designated his reasonable expenses incurred in the inspection of the land complained of on which any of the weeds mentioned in the schedule are not found. Upon receipt of such complaint it shall be the duty of said highway commissioner, street commissioner, or other officer to inspect the lands or lots mentioned in the complaint and if any of the weeds mentioned in Schedule A are found growing thereon, he shall notify the owner, lessee, or occupier of the land in writing to destroy them, and if the weeds are not destroyed at the expiration of five days after service of notice, he shall employ such labor as is necessary and enter the lands and destroy in the most practicable and economical manner [or in the manner prescribed in the schedule] all of the weeds mentioned in the schedule that are found growing thereon: *Provided, however*, that in case there is no resident owner, lessee, or agent responsible for the care of the land the service of notice may be omitted.

Sec. 8. Each highway commissioner, or other officer designated in section 7, shall make an itemized statement, duly verified by oath or affirmation, of the expenses incurred in inspecting each tract of land or lot on which weeds mentioned in Schedule A were found growing and of all expenses incurred by him for destroying said weeds, which statement shall contain a description sufficient for identification at the office of the county assessor of each tract of land or lot on which such seeds were destroyed under his direction, together with the name of the owner, lessee, or occupier of said tract of land or lot, and he shall deliver each such statement to the county assessor, and a certified copy thereof to the county auditor. He shall also issue vouchers for himself and for each assistant employed in inspecting weeds, at the rate of —— dollars per day, and to each laborer employed in destroying weeds at the rate of —— dollars per day, for the time actually employed. These vouchers shall be presented to and audited by the county auditor who shall endorse thereon the amount he finds due, and then they shall be returned to the payee named therein or his assigns, or legal representatives, and be paid by the county treasurer out of any moneys not otherwise appropriated, or they shall be receivable for county taxes, within the county in which they were issued, to the amounts endorsed thereon by the auditor.

LEGISLATION RELATING TO FISH AND GAME

By *Dwight W. Huntington*

The former great abundance and the charming variety of the wild food-birds and mammals and game fishes of North America often have been described by writers who are still living. The rapid decrease of all of the species and the practical extinction of some, notably the bison (Vol. III, pp. 287–292) and the wild pigeon (Vol. III, p. 520), are well known and often have been deplored. In colonial times, the largest and best pheasant in the world, the wild turkey (Vol. III, pp. 586–587), was abundant and cheap in the markets of New England and in other states where it is now extinct; a bounty was paid for the ruffed grouse (the "partridge" of New England, the "pheasant" of the West and South, Vol. III, pp. 576–578) because it budded the fruit trees. Apprentices in Massachusetts stipulated in their contracts that they should not be fed often with the delicious heath grouse (there are fewer than one hundred of those birds alive in the world today), and slaves in the South objected because they were fed too often with the now rare and costly canvas-back duck. The marvelous abundance of the prairie-grouse, the sharp-tailed grouse and the sage grouse, on the Western prairies, plains and deserts, was evidenced by the carload lots of grouse which came to the Eastern markets a few decades ago. The best all-round game bird in the world, the Virginia partridge (bobwhite, Vol. III, pp. 584–585), was abundant on every farm and clearing as far west as the great plains, and was cheap in the markets; and several beautiful plumed and crested partridges were even more plentiful in the Southwestern and Pacific states. A splendid list of swans (Vol. III, pp. 585–586), geese (Vol. III, pp. 572–576), brant and ducks (Vol. III, pp. 569–572) including the choicest varieties to be found in the world, and many valuable species of shore-birds or waders (*Limicolæ*), including the woodcock, snipe and plover, were so plentiful that no one thought they could be exterminated. The large game mammals, the moose, elk (*wapiti*) and several smaller deer (Vol. III, p. 163), were abundant in the North American forests. The antelope in great bands roamed the western plains, which were inhabited by the bison, and mountain sheep and goats (Vol. III, p. 597) easily were shot in the western mountains within the writer's recollection. The smaller mammals, the hares and rabbits (Vol. III, p. 167), were sufficiently numerous in many places to be regarded as pests. Today, however, all game is rare and costly (the rabbits excepted); whenever it can be sold, it commands prices which to most persons are prohibitive. The best game fish, which a few years ago easily were caught in abundance in the North American lakes and streams, have decreased in many places as rapidly as the game has decreased; and in most of the states and in the provinces of Canada the taking of both game and fish has been much restricted by legislation (Vol. III, p. 390).

Game laws of the United States and Canada.

The game laws of the United States and the Canadian provinces furnish an interesting illustration of the fallibility of legislative reasonings. The wild food birds and mammals and the game fish have continued to decrease rapidly, although upwards of a thousand game laws have been enacted in the effort to increase them (Vol. III, p. 396).[1] It is fair, however, to say that the notions which preceded the making of these laws originated in the minds of sportsmen, and that the lawmakers should not be blamed for listening to those who have no desire to exterminate the game.

The earliest game laws were enacted by the colonies, and provided for close seasons for certain species of game. The first laws related to the deer only. A New York statute (1709) provided for close seasons for deer, turkeys, heath hens, partridges or ruffed grouse, and quail, and, from time to time, similar laws which related to seasons were enacted in the other states and in the provinces of Canada. Laws protecting insectivorous birds were enacted in Connecticut and New Jersey (1850), Vermont (1851), Pennsylvania (1853–1858), Massachusetts (1855), and Ohio (1857). [See Vol. III, pp. 169–173.] West Virginia (1869) seems to have been the first state to extend protection to all birds except a few injurious species. In most of the United States and Canadian provinces, the non-game birds, excepting some predaceous and harmful species, are now protected throughout the year; there being some exceptions, permitting the farmers to control the birds when they prove to be injurious to fruits or grain. Similar exceptions are found in some of the laws protecting rabbits and squirrels, which permit the destruction of these animals in the close season, when they are found to be injurious to trees, grain or gardens. [Certain species of hawks and the crow, great-horned owl, crow blackbird, kingfisher and English sparrow are the birds most often excepted from the provisions of the laws protecting non-game birds. The Ohio law (1906) provides that rabbits may be killed at any time, except on Sunday, when they may be found injuring "grain, berries, fruit, vegetables, trees or shrubbery." The New Jersey statute (1905) provides that, on permit from the Commissioners, land-owners may trap rabbits injuring crops. Similar exceptions are found in other state laws. Comparatively few states now permit the destruction of birds injurious to fruit. This matter seems to be a bone of contention between the Audubon societies and fruit-growers.]

As it became more and more evident that game and game fish were decreasing rapidly, many new laws, planned by sportsmen or suggested by the sporting magazines, were enacted from time to time. All of these laws seem to be based on the idea of protection or restriction, i. e., the protection of game or the restriction first, of market gunning and later, of field sports. It was thought, by those urging the enactment of the new laws, that the game naturally would increase, provided it was relieved, partially, from one check to increase, that is, shooting.

From the middle of the nineteenth century until the present time, these protective laws have increased in number rapidly; but to the surprise of those who urged their enactment, the game has continued to diminish, excepting in places where very little shooting is permitted and in places where shooting is prohibited for a term of years. The game and fish laws of the United States and of the Canadian provinces are similar in plan and evolution; together they may be outlined as follows:

(1) *Laws prescribing close seasons*, when the game and fish may not be taken. These laws at first permitted the taking of game and fish during long open seasons; permitted the shooting of snipe and wild-fowl in the spring, of woodcock as early

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[1] In number of game laws and for frequency of change in their provisions, the United States probably surpasses all other countries of the world. Nearly seven hundred game laws have been enacted by state legislatures during the period 1900–1907. (Bulletin No. 28, Biological Survey, United States Department of Agriculture, August 1, 1907.) Prior to the year 1900, there were many more laws in the United States than in any other country. References to many new laws proposed will be found in the reports of the state game officers. The fact that the game is increasing in populous countries that have not enacted these numerous game laws is significant.

as July, and of prairie grouse, sharp-tailed grouse and sage grouse as early as the first of August.

Spring and summer shooting are evidently wrong, and the laws should be made uniform in all of the states and provinces, prohibiting shooting until September 1, excepting prairie-grouse shooting. The grouse are large enough for the gun by the middle of August, and this should be made the opening date for grouse shooting on game farms and preserves, where the birds are properly looked after. Grouse shooting in England and Scotland begins August 12, and the birds always are abundant and cheap in the markets of England and Scotland.

From time to time the open seasons have been shortened; spring shooting and summer shooting at woodcock have been prohibited, and, when certain species of game appeared to be nearing extinction, all shooting has been prohibited for a term of years. Shooting also has been prohibited for a period of years when the states or provinces have undertaken the introduction of English and Chinese pheasants, partridges and other species of foreign game. The open seasons are now very short everywhere, and the tendency is to make them still shorter as the game diminishes. The shortest open season (four days) is for deer on Long Island. The laws prohibiting shooting for a term of years often have not resulted in an increase of the game thus protected. The reasons for the failure are that the natural enemies of the game—foxes, hawks, crows and many others—are not controlled, and often, before the laws are enacted, have become superabundant when compared with the game, by reason of the great reduction of the game. The result of such condition necessarily is a continued decrease of the game, since nature's balance is upset. The game enemies often show an increase during the close period; there always is a certain amount of illegal trapping and shooting; the natural foods and covers of the game are destroyed as population increases; there are losses due to farm machinery (the cutting out of nests), to forest and prairie fires, and to various other causes, when no one looks after the game; the fatal house-cat and dogs and rats show an increase. The heath-hen, for example, on Martha's Vineyard (the only place where it now occurs) has decreased rapidly under prohibitive protection. The state game officers charge the loss to cats and forest fires. (Massachusetts Report 1906.)

In most of the states and provinces, shooting on Sunday is prohibited, and certain days of the week during the open season are sometimes designated as "rest days," when no shooting is permitted. In some of the states there are numerous county laws providing for a variety of open seasons for the different counties.

The Chinese pheasants (Vol. III., p. 581) were first introduced into the United States by Judge Denny, of Oregon (1881). That state first enacted a law protecting pheasants for a term of years. Big game and the native game-birds then were extremely abundant in Oregon, and the pheasants increased rapidly over a wide area, in all probability because the state was not densely populated, and the temptation to shoot the pheasants was not great because of the abundance of larger and better game.

(2) *Laws prohibiting the sale of game.*—The laws prohibiting the sale of live game for propagation evidently tend to prevent the sensible increase of game. The state officers, of one state at least, regard these laws as a mistake, and issue permits to those who wish to sell game for propagation. The legislation restricting the sale of dead game has varied much in the different states and provinces, and is often changed. The tendency is everywhere to deprive the game of the benefits due to the ordinary medium of exchange. Although it seems a poor way to increase anything by making it contraband, the free sale of game from places where no one properly looks after it has uniformly proved to be disastrous. On the other hand, the prohibition of sales and other numerous restrictions of sport make it not worth while for any one to rear and protect game. This difficulty recently has been well overcome in a few states by amendments to the laws permitting the sale of game and fish from preserves.[1] Forty-three states and territories, and most of the provinces, now prohibit the sale of all or of certain kinds of game at all seasons. [See Farmers' Bulletin No. 308, United States Department of Agriculture.]

The prairie grouse have decreased more rapidly than other upland game-birds because they are more easily shot than the other game-birds are. Practically every state in which prairie grouse occur now prohibits their sale or export, but the grouse continue to diminish rapidly and seem to be doomed to extinction in all places where any shooting is permitted. They quickly can be multiplied on private preserves and game-farms, and would be very profitable provided the laws be amended to encourage such industry.

(3) *Bag and catch limit laws.*—Many laws prescribing the number and sex of the various big game mammals, the number of birds and the number and size of the fish that may be taken in a day or season, have been enacted during the past quarter of a century in the United States and in Canada. The number that can be taken has been decreased from time to time as the game and fish diminished, until it is now legal in most of the states and provinces to take only one or two of the larger mammals ("with horns," as the statutes often read, to prevent the killing of does) in a season, and a very small number of birds and fish. The number varies much in the different states and provinces, and usually is smaller for the species which have decreased most rapidly than it is for the species which are more numerous. [For table of bag limits for the United States and Canada

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[1] Colorado permits the sale of game and fish from preserves under state regulation (Col. Stat. 1903, as amended 1905). Vermont also permits the sale of game from preserves. Colorado, Minnesota, Massachusetts and some other states permit the sale of trout from preserves. Laws permitting the sale of game and fish from preserves should be enacted everywhere.

(1907) see Farmers' Bulletin 308 United States Department of Agriculture, pp. 42-48. The game clubs view with alarm the rapid decrease in the size of the bag. There is danger that this legislation will amount to a confiscation of many club properties, since it will not pay to keep up the properties for a very small number of birds. The tendency to except the clubs from the game-law restrictions in some states may be noticed.] The "game hog" idea (i. e., that it is disgraceful to shoot much game in a day and that those who do so are "game hogs") was exploited for many years by the editor of Recreation (now Shields' Magazine), and in all probability the magazine accomplished more than the game laws accomplished. Convictions under the bag and catch limit laws are uncommon, and it seems doubtful whether many persons either observe the laws or heed the exhortation of the editor, when they are in the fields and woods. The strongest game-protection association in America does not favor this kind of legislation, for the reason just stated. Mr. Shields, the editor of Shields' Magazine, who has done as much as any one to build up the present restrictive system of game laws, now admits their failure to accomplish the best results. In a letter to the writer he says: "The time will come, and that within a few years, when the only game to be found in the United States will be on public or private preserves, with possibly some overflow." See The Independent, May 7 (1908), for other editorial opinions and a full discussion of the popular prejudice against preserving.

(4) *Laws prohibiting the export of game and fish.* The constitutionality of a Connecticut statute prohibiting the export of certain game was upheld in the United States Supreme Court in 1896. Since this famous decision was rendered, most of the states and provinces have passed laws prohibiting the export and shipment of all or certain kinds of game, and in some states even the non-resident sportsman is prohibited from taking his game home. It seems to be evidently wrong to charge the non-resident a high license fee for the privilege of shooting and at the same time to prohibit his taking his game out of the state. Numerous exceptions have been added to the laws, which permit the sportsman's transporting all or a part of his game. In the United States, dead game is held by the courts to be the property of the state and still subject to its regulations, and not to be personal property, as it is in all countries where game is profitably plentiful.

(5) *Trespass laws.*—In addition to the general trespass laws, numerous laws intended to afford greater protection against trespassing gunners to land-owners and their tenants have been enacted. As early as the latter part of the eighteenth century, the game laws of North Carolina contained provisions prohibiting hunting on another's land without permission, and similar laws subsequently were enacted in Virginia, Maryland, Tennessee and other states. [See Yearbook United States Department of Agriculture, 1904.] These laws provide penalties for shooting or fishing on private lands and waters (which are posted) without permission of the owner or lessee, either verbal or in writing.[1] In some places, exemplary damages also may be recovered by the owner of the lands or by the lessee of shooting and fishing rights thereon. [See chap. 130, New York Stat., sec. 31-32, (1908).] The tendency, it will be observed, is to regard the shooting and fishing rights as valuable. The value always is increased when restrictions on sport are removed.

(6) *Miscellaneous restrictive laws.*—There are a very large number of minor restrictive laws which have originated in different states during the last quarter of a century. Many of these have been copied by the other states and by the provinces. Some of these restrictions are curious and even fanciful; it would be impossible here to list them all. The more important laws prescribe the kind and gauge of weapons that may be used; the kind of fishing-tackle and the number of hooks that may be used; prohibit night shooting or shooting early in the morning and after sundown; prohibit the use of traps, nets, snares, dynamite and ferrets in the taking of game or fish; prohibit the use of certain lures (salt for deer for example); prohibit shooting from batteries, boats and certain kinds of ambush, and at certain distances from shores, and in public roads; prohibit the use of hounds in taking deer and the exercise of bird-dogs during the close season. In many states where big game occurs, the sportsman is required to employ a registered guide to accompany him afield and act as a special policeman to oversee his employer's actions. These restrictions have become so numerous during the past few years that few persons know or care much about them or their variations from year to year. They all may be regarded as mere decorations of a system which has nothing to do with the increase of game, but deals exclusively with the restriction of shooting and fishing. The constitutionality of some of these laws, notably those prohibiting the use of certain kinds of guns, seems to be very doubtful, and this question is pending in the courts.

The miscellaneous restrictions are increasing rapidly. The following examples taken at random from state and provincial laws, indicate their great variety. In Maine, "no salmon or other migratory fish shall be taken or fished for within 500 yards of any fishway, dam or mill-race, nor shall hook and line or artificial flies be used at any time within one hundred yards of any fishway, dam or mill-race;" "fly-fishing shall be allowed up to the bridge across Denny's river," etc. In Minnesota it is unlawful to run pointers or setters except during the open season, or to keep any dog about any hunting-camp or lumber-camps. In Montana, persons taking game to prevent great suffering by hunger are excepted.

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[1] These laws often exhibit a fatal weakness. When they provide for a certain number of warning signboards or the placing of them at certain distances, the use of certain language, etc., a failure to comply with the terms of the law is sufficient to prevent a conviction, since criminal laws are construed strictly in favor of the accused.

In Wyoming, it costs ten dollars to photograph big game under the supervision of a game warden. In Nova Scotia, it is unlawful to use a rifle loaded with ball-cartridge to kill wild fowl; to use a punt or swivel gun, artificial light or flambeaux for the destruction of wild fowl, or to kill any game excepting "blue-winged ducks" between sunset and sunrise. In North Carolina, it is unlawful to sail (on the Lord's day) on Currituck sound for the purpose of locating wild fowl for a future day. It is also "unlawful for any person, hired or employed, to lay around, sail around or stop anywhere near any citizen who may be gunning or fishing, for the purpose of keeping him from shooting or damage his shooting." In Newfoundland, it is unlawful to kill caribou with hatchet, tomahawk, spear, machine, contrivance or weapon other than firearms loaded with ball or bullet. There are many hundreds of these interesting laws in North America. They do not occur in countries which have game in abundance. The market gunner in England may shoot a punt gun and kill an hundred fowl at a single discharge.

(7) *Laws creating game departments and offices.*—Most of the states and provinces have entrusted the care of the game and fish and the execution of the laws to special state or provincial officers, usually named game commissioners or game wardens. In some of the Canadian provinces, the minister of agriculture or other provincial officer issues the shooting license and is charged with the protection of the game. In Alberta, Manitoba and Saskatchewan, the Department of Agriculture has jurisdiction over matters pertaining to game. Nova Scotia has a Board of Game Commissioners. British Columbia has a Provincial Game and Forest Warden, etc. The United States Department of Agriculture annually issues a bulletin containing the names and addresses of all of the United States and Provincial game and fish officers. This directory presents in convenient form the names of persons to whom application may be made respecting game laws, and also contains a list of the organizations concerned with game protection, including the Audubon societies. The last directory (1908) is Circular No. 65, Bureau of Biological Survey, United States Department of Agriculture.

The powers given to the state game officers sometimes are extraordinary; the right to search without warrant, for example, seems to be growing in popularity. The confiscation of guns, nets and other devices often is provided for and often is contested in the courts. Seventeen states and the District of Columbia provide that wardens or other officers may search designated places without a warrant. For details of this right to search, see Bulletin No. 28, Biological Survey, United States Department of Agriculture (1907), pp. 46–49. The right to seize game has been bestowed on officers by nearly all of the states. A few states provide for the right to seize implements. For accounts of late seizures, table showing disposition of game seized, etc., see Bulletin on Game Commissions and Wardens, United States Department of Agriculture (1907). The outfits of persons found hunting or in possession of game killed in the Yellowstone National Park are subject to seizure and confiscation. For park game law, see Game Laws in Brief, Quarterly, Forest and Stream Publishing Company, New York.

Game protection was originally entrusted to sheriffs, constables or other officers having ordinary executive duties. The office of fish commissioner preceded the office of game commissioner, and in some states the care of the game was first given to the fish commissioner. Maine (1843) was the first state to provide a special officer charged with the protection of fish. The fish commissioner came into existence in 1865, in Massachusetts and New Hampshire, and in 1867, in Connecticut and Vermont. The New Hampshire Commission subsequently was reorganized as the first fish and game commission of the country. In 1868, New York created a fish commission which, in 1871, was charged with the protection of game as well as of fish. The office is now held by a single commissioner, who also has charge of the forest and shellfisheries. Most of the other states and the Canadian provinces have followed the example set by New England and New York. (See Vol. III, p. 390.) The term of office of the game officers is short. In a majority of the states it is only two years. The longest term (Tennessee) is eight years.

Most of the state and provincial officers issue annual or biennial reports in which are recorded the receipts and expenditures of the departments; and there is usually some comment on the numerous criminal cases handled during the year and the amount of the fines collected. In many of the reports, the continued decrease of the game is deplored and new and more drastic laws are recommended. Some of the officers admit in their reports the probable extinction of the native game-birds, and report progress in the introduction and propagation of English pheasants and Hungarian partridges, which, they claim, must be substituted for the indigenous game which is said to be vanishing. We have here official recognition of the absurd notion (which seems to be spreading in North America) that our native game is at fault; or, in other words, that similar game-birds are always abundant and cheap in the markets of other countries because they are better than our own birds. The fact that the game-birds are profitably plentiful in the older countries, because they are properly looked after by the farmers and their shooting tenants, seems to have been overlooked.

(8) *License laws.*—On the creation of the first game and fish departments, they were supported by appropriations from the state treasury. The amounts appropriated were small, and often were objected to on the ground that they were made in the interest of sport. The sportsmen having directed the management of the game so as to prevent any one excepting themselves from having any of it, it seems natural that they should tax themselves to support the game officers. New York enacted the first license law in 1864, but this statute (Laws 1864, Chap. 426) was repealed before it had an opportunity to go into effect. Maryland

had the first license law actually executed (1872) to regulate wild-fowl shooting on the Susquehanna flats by retaining the business for the benefit of residents, and at the same time raising a revenue for enforcing the game laws. There now are four kinds of licenses in most of the states and provinces: (1) Resident, (2) non-resident, (3) alien and (4) market. The resident license fee is usually small,—one dollar in most places. The non-resident license fee varies from five dollars to one hundred dollars. The amount is smaller, usually, for birds than for big game. The alien license, usually large, is growing in popularity, and is intended to restrain a lawless class of foreigners who shoot song-birds and game out of season, and who have proved to be a difficult class for the game officers to handle. As market gunning and the sale of game are prohibited, the market license disappears. It reappears in places where dealers and game preserves are licensed to sell game from the preserves.[1] In some states, non-residents owning lands in the state are required to pay only the resident license fee, and non-resident members of shooting clubs also have been thus favored. In Arkansas, non-residents were prohibited from shooting, but the court held that non-residents could not be prohibited from shooting on their lands.

Federal laws relating to game.—The United States statutes relating to game are: (1) An act approved May 25, 1900 (commonly known as the Lacey law), which reinforces the state laws by regulating the importation of game and its shipment from one state to another. The Lacey law requires the marking of game packages so as to show the nature of their contents, and makes it an offence punishable in the United States courts to ship game in violation of the state laws; (2) the Tariff law imposing duties on imported game; (3) the law regulating the introduction of eggs and game birds; (4) laws protecting game in Alaska, the District of Columbia, the national parks, forests and government reservations. Shooting and the transportation of game in the national parks is prohibited. For outline of Federal laws, see Farmers' Bulletin No. 308 (1907), United States Department of Agriculture. See, also, Bulletin No. 16, Biological Survey, United States Department of Agriculture; see Circular No. 29, for the Lacey law. For abstract of Federal, State and Provincial Laws, see "Game Laws in Brief," Quarterly, Forest and Stream Publishing Co., New York.

Game-protection associations.

Many national, state, county and provincial game-protection associations have been organized during the last quarter of a century, and the number of these associations is increasing.[1] The object of these associations is to coöperate in the work of protecting game and to urge and assist in the execution of the laws. It will be observed that all of these associations look to the laws to protect the game, and that none of them deals directly with the game, or urges its increase and propagation by private enterprise. There are, besides the protective associations, many Audubon societies formed for the protection of song-birds and other non-game birds. These associations also urge the enactment of laws protecting game. As the game has diminished, many new methods of restriction have been suggested by these numerous associations, and the laws suggested are added to the great mass of legislation outlined above. The idea that game can be increased only by restrictive laws checking the demand seems to be always uppermost, and the fact that the numerous laws make it not worth while for individuals properly to look after the game and increase the supply seems to be entirely overlooked.

When the oyster industry was regulated by restrictive laws, very similar to the game laws, the oysters were in danger of extinction and great alarm was expressed about the loss of this food supply. The oysters are now properly looked after by individuals; the star-fish and their other enemies are controlled, and the oysters are profitably plentiful and are increasing. The game and fish laws may well be remodeled. The food question is more important than sport to the community, and should first be considered by the state. The North American game laws, both those of the United States and those of the Canadian provinces, are not founded on the principles that should underlie all criminal enactments. They are not permanent, uniform and universal. They are changed so often that the people can not be expected to know what the crimes due to the game laws are. Where criminal laws are not uniform they clearly are unfair.

Game enemies.

In the making of the North American game laws, the natural checks to the increase of game, vermin and climate, have not been considered. The natural enemies of game—wolves, foxes, hawks, weasels, skunks, snakes and many others, which are collectively termed vermin by practical game preservers,—annually destroy a very large percentage of the game,—far more than is taken by the guns. The game shot by North American sportsmen appears to be that which nature would spare for restocking the fields and woods, and for this reason the game must necessarily decrease, notwithstanding the many game-laws made for its protection, provided any shooting is permitted. The effect of many small bags of game proves to be as disastrous as the making of a smaller number of big bags was some years ago. In populous regions, the cats, dogs and rats are serious additional checks to the increase of small game, and often upset nature's balance in places where shooting is prohibited. There are numerous laws protecting some of the game enemies at all times or during certain seasons. Skunks, minks, certain hawks, etc., are protected. These laws are often changed.

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[1] For table showing dates of adoption of the license system, 1864-1906, see Circular No. 54, Bureau of Biological Survey, United States Department of Agriculture. For History of Shooting Licenses, see Bulletin No. 19. For details as to fees, officers, privileges of shipping game, etc., see Farmers' Bulletin Game Laws 1906-7, United States Department of Agriculture. For fees charged in the United States and Canadian Provinces, and on changes in laws, see: Game Laws in Brief, Quarterly, Forest and Stream Publishing Company, New York.

[1] One of the United States associations was organized in 1844, another in 1865, and five others were organized more than twenty-five years ago. The first associations in Canada were one in Nova Scotia (1853) and one in Quebec (1859). There are now eight associations in Canada. There are state and local associations in twenty-eight of the states. See Circular No. 65, Bureau Biological Survey, United States Department of Agriculture, for directory of officers of these associations (1908).

The English game law.

This law is simple, uniform and permanent. There has been no important change in the law for over seventy-five years. Although the game is regarded as the property of the Crown, the burden of caring for it is placed on the people, and for all practical purposes the game is regarded as personal property while it is alive, and becomes a chattel as soon as it is shot. Alive, it may wander where it cannot be followed because of trespass laws, or be taken in replevin; but, when it is legally shot by the landowner, sportsman or market gunner, it may be sold as openly as any other personal property. The English law is scientific, since it is founded on the principles which should underlie all criminal enactments, and the fact that nature's balance easily is upset by the addition of any causes of destruction, has been duly considered. The English people know that the game can not survive shooting and the destruction due to natural causes at the same time. Although the Crown is said to own the game, just as the people are said to own it in North America, the Crown is aware that it can not control all of the foxes, hawks, cats, and other game enemies, which are found on every farm, and, therefore, it insists that the people must look after the game and protect it from its enemies if they wish to shoot it. Those who look after the game and increase it are encouraged to do so.

A legal blunder.

The United States and Canadian provinces seem to have made a legal blunder at the start. The well-known legal maxim that the title to the game is in the Crown reappears in the statutory assertion in most of the states that the title to the game is in the State, or that the people own the game in their sovereign capacity, as the statutes sometimes read. The fact that in England this declaration of title is regarded as a legal fiction not to be insisted on too strongly when it comes in conflict with common sense, has been overlooked. In North America, the state or province is required to look after the game, because it is said to be the sole owner of it. The game officers, however, are required to perform an impossibility, for the reason that they can not control the game enemies and thus make a place for shooting. An immense number of new crimes has been created by the restrictive laws, and these require the entire attention of the game officers. They have no time to consider the natural enemies of game, and its food habits and the covers which it needs. These matters always engage the attention of game-keepers. The cat alone is said to "destroy more game-birds than all the sportsmen, boys and collectors put together" (Vol. III, p. 299). Bills have been introduced in some of the legislative assemblies, providing for the control of the cats. These promptly have been defeated, since the farmers and other owners resent the destruction of their cats. The cats easily are controlled on all places in England and America where the game is preserved, under an agreeable arrangement between the farmers and the game-keepers. The preservation of natural foods and covers, which prevents in a large measure, the losses due to climate, also is arranged for when the land-owners are consulted. It is evident that the State can not arrange these matters on all of the farms under the promise that it will provide licensed trespassers to shoot the game that the farmers may rear and protect.

Game-preserving.

The advantages of the individual system of game-handling have been proved, not only in England and in Scotland, but also in many places in North America. Both the sportsmen and the market gunners have better shooting and enjoy more freedom in England than they do in North America, and many Americans now go abroad every year to shoot. Two reasons may be assigned why we did not generally adopt the English system long ago: (1) there was no necessity for game preserves while the game was abundant in the markets, and (2) there has been always a prejudice against the preserve system in America. It has been assumed, erroneously, that the shooting on preserves is always at tame game, and that only persons of abundant means can shoot on preserves The grouse and partridges, however, are as wild in England and Scotland as our prairie grouse and partridges were when they were plentiful, and many men of small means and a large number of market gunners, who do not pay any shooting rent or own any land, shoot in England and Scotland. The idea that the game is tame on preserves has been formed by reading accounts of shooting the hand-reared pheasants. These birds undoubtedly are more tame than the wild-bred grouse and partridges.

There are now many game preserves in the United States and Canada, and the number is increasing. The first preserve (for duck shooting) was created prior to the Civil war by some New York men on Currituck Sound, North Carolina. Within the past twenty-five years, the duck clubs have become very numerous, and they now control all of the best duck marshes as far west as California. Upland preserving has been undertaken in many of the states and provinces, and these preserves also are increasing. For the most part, the preserves do not employ game-keepers to look after the game and increase it, and for this reason the game does not always increase or, in some places, even hold its own, on the preserves. On all of the preserves where game-keepers are employed and the natural enemies of the game are controlled, the game has increased fully as rapidly as it has in England, and it remains plentiful although thousands of birds are shot every season. The shooting is usually better on unpreserved ground in the vicinity of preserves than it is elsewhere in the state, because of the overflow of game from the preserves, so that every one who shoots is benefited. [For numerous facts on this point see Observations made at American Preserves, American Field (Chicago), April, 1908.]

The best upland preserves are in North Carolina. The plan is everywhere the same and is very simple. The game is as wild as it is anywhere, but it is always abundant,—in some places almost too abundant. One or more sportsmen rent the shooting on a number of adjacent farms for a term of years. The amount paid to the farmers is five to ten cents per acre, per annum, or the amount of the taxes on land and buildings. In most cases, but not always, one of the farms is purchased and a shooting-lodge is erected, or a farm-house is remodeled for the use of the shooting tenants. A game-keeper—sometimes a farmer—is employed to control the game enemies and to look after the sportsmen's dogs. This system of preserving has proved to be popular with the farmers and also with local sportsmen. Some of the last named have formed syndicates to share the expense of having similar preserves of their own. The system is popular, also, with the store-keepers and others in the towns, since money is brought into the neighborhood by those who come to shoot. In Guilford county (North Carolina) alone, the shooting privileges are leased by non-residents over 153,000 acres of agricultural land, the farmers receiving enough, or a little more than enough in some cases, to pay their taxes. The state game officer of North Carolina says that the general plan seems to operate with universal satisfaction.

In North Carolina, the open season is long, the bag limit is large and the non-resident sportsman is permitted to export fifty partridges or quail, fifty snipe, twelve grouse and two wild turkeys. All restrictions might well be removed from these preserves, since the game is properly looked after and always is abundant. An increase of legal restrictions similar to those common in most of the states would put an end to those preserves; the farmers would no longer receive shooting rentals and the game would diminish.

It will be noted that the game is abundant because the farmers' interests have been consulted, and that vermin is controlled with their permission and assistance.

The North Carolina system of game preserving might well be extended to other states, bnt the game laws must first be amended in the interest of the farmers. No one can be expected to rent the shooting on places where the season is short and where the bag is limited to a few birds per day or season. The sale of game from game farms and preserves would add to their value and tend to increase their number, since the sale of game offsets the cost of looking after it and protecting it from its natural enemies. The farmers would be directly benefited by the change, and the sportsmen would enjoy far better shooting than they now enjoy. The benefit to the farmers will amount to millions of dollars annually, provided enough game for the markets can be produced, as it easily can be, if the natural enemies of the game are controlled.

Hotel preserves.—There are in the United Kingdom many sporting hotels with game-ground attached. Here the guests of the hotels find good shooting and fishing at moderate prices. In the United States, a number of preserves recently have been created by hotel-keepers for the entertainment of their guests. The preserve at Pinehurst, North Carolina, owned by Mr. Leonard Tufts, is of this character. The preserve contains 40,000 acres, and good dogs are furnished by the management. Game-keepers recently have been employed to increase the game. The preserve owned by the Hotel Chamberlain, at Old Point Comfort, Virginia, also is a large one, and there are others in the South where the game-law restrictions are not so severe as they are in the North. A large number of small hotels throughout the country profitably could create game preserves and provide good shooting and fishing for many people and game and fish for their tables, were it not for the laws which prevent such industry.

Deer parks and preserves.—Many individuals and clubs have created preserves for elk and deer within the past twenty-five years. Both deer and elk are now plentiful on a few preserves in New Jersey, on many preserves in the Adirondacks, and in Pennsylvania and other states. Deer are abundant near New York on the preserve of the South Side Sportsman's Club on Long Island, and in the vicinity of the preserve many deer are shot by local gunners and others who do not own any interest in preserves. In 1902, the Otzinachson Rod and Gun Club placed ninety deer, mostly does, in their 4,000-acre park in Clinton county, Pa., and these have multiplied to nearly two thousand head and are increasing rapidly. The chief obstacle to the profitable propagation of deer in the United States and Canadian provinces is the restrictive character of the laws. In some of the states, deer reared in preserves are excepted, partly at least, from the general restrictive laws, and the tendency seems to be to regard such game as personal property.

The game laws everywhere provide that deer may be shot only during a short open season, when the flesh is in poor condition for the table; and here we find another illustration of the fact that the game laws have not been enacted advisedly.[1]

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[1] For brief account of other deer-farms and preserves, and matter relating to the management of deer; experiences of breeders; the game laws in relation to deer-farming; the profit of this industry, etc., see Farmers' Bulletin No. 330, United States Department of Agriculture (1908). The deer in New England, where shooting has been prohibited for a term of years, have increased, and in many places they have damaged crops. Some states permit the killing of deer which are injurious.

Laws for the protection of fish.

Laws regulating the fishing seasons and the methods of taking fish have been in the statute books of civilized countries for centuries, but they have not prevented the decrease and even the practical extinction of the fish in many places. In addition to the wholesale destruction of fish by man for sport and profit, and the destruction by their natural enemies, the fish, like the game, have suffered a diminution from many other causes incident to civilization, notably the building of dams and the pollution of waters, and many laws have been enacted to mitigate these evils. Although the necessity for increasing the supply was evident long ago, it was considered to be impossible to restore the fish to their old haunts until the discovery of Jacobi (about one hundred and fifty years ago), that fish could be greatly multiplied by hatching fecundated ova in hatching pools, was made known. This discovery was followed by many experiments in fish-culture, which proved to be successful in England, and later in the United States and Canada. But little was done in North America, except in a private way, until the work was taken up by a joint commission composed of commissioners of Vermont and New Hampshire (appointed in 1864), Massachusetts (1865), and Connecticut (1866). In the year 1867, these commissioners met in Boston and organized under the name of "The New England Commissioners of Inland Fisheries," "to coöperate in the restocking of the Connecticut river with salmon and shad," under the following arrangement: New Hampshire was to procure and distribute impregnated ova of salmon and shad in the headwaters of the river; Vermont and Massachusetts were to build suitable fishways for the passage of fish over the dams to the spawning grounds; and Connecticut was to abolish gill-nets, stake-nets and pounds in the river and on the Sound." [See Report, Commissioners of Fisheries and Game, Connecticut (1906) pp. 6 et.seq.]

Starting thus in New England, the work of fish-culture attracted one state after another and the federal government, which, in 1870, authorized the President to appoint a commissioner of fisheries to investigate the subject and report to Congress. Large sums now are expended annually by the federal, state and provincial governments for the support of extensive fish hatcheries. In order to supplement this work and to supply the markets with game fish, the states and provinces should encourage private enterprise to propagate fish in private waters and should not restrict such enterprise by hostile legislation. [The South Side Sportsman's Club on Long Island has a successful hatchery for trout, and many thousands of trout are caught every year by the members of the club in the stream and ponds on the preserve. Other preserves have their own hatcheries, but most of them purchase young trout for restocking their waters.]

The artificial propagation of fish has been far more successful than the propagation of game birds in North America. The federal, state and provincial governments now produce millions of fish fry in their hatcheries, and these are distributed every year to restock the public waters. The propagation of game-fish at individual and club hatcheries and in private ponds also has been successful, and several of the states have amended their laws to permit the sale of fish from preserves. The propagation of trout and other game-fish promises to become a profitable industry in places where the laws permit sales. The fish have numerous enemies,—snakes, certain birds and other fish,—which must be controlled to insure success. Where the fish are abundant they may be made to yield a handsome revenue to the owner, either from fishing rentals or from the sale of fish, or both.[1]

Field sports.

The popularity of field sports in North America is evidenced by the number of those who shoot, which is estimated for the United States alone at 3,000,000, or one out of every twenty-nine persons in the country. [The figures were furnished by Mr. Henry Oldys of the United States Department of Agriculture.] The value of shooting and fishing as health-giving sports is well known, and often is referred to in the reports of the state game officers; but the direct and incidental money value of the game to the farmers and other landowners, and the value of game as food, are never mentioned in the state reports, since the game has no money value under the restrictive system because, as we have observed, the sale of game as food is prohibited in most places. It is evident to all who read the state and provincial laws and the reports of the game officers, that the game question has been studied with sport and the interests of sportsmen only in mind. Although the laws assert that the game belongs to all of the people, they are so made as to prevent the majority of the people from having any game.

Field sports, however, can be and have been made to serve a much larger purpose than is represented by the pleasure of those who go afield with rod and gun, and without diminishing, but on the other hand, increasing, the opportunities for shooting and fishing. The land-owners and all of the people in the community are directly benefited when the game is intelligently looked after by individuals and sold as cheap food in the markets. The absurd notion that it is disgraceful and even criminal to sell game has been insisted on so long by some of the sporting editors in their endeavors to save the game from extinction, that many sportsmen believe it is wrong and even criminal to sell game. Field sports tend to keep people in the country and form a sufficient counterpoise to the pleasures of the town. The abandoned farms alone in the United States are sufficient to supply the people with game of all sorts at prices lower than those charged for beef and poultry, provided the game be properly looked after. Field sports also tend to bring people from the cities to the country, either temporarily or permanently, and bring about a mixture of classes which for many reasons is desirable.

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[1] Fish have numerous enemies. It has been found to be a positive fact that 95 per cent of the artificially hatched fry continue to live when but 2 per cent of those naturally propagated live. This is owing to natural enemies which besiege the small fish and various other reasons.—Dr. David Starr Jordan, Sp. Rev. Aug. 15, 1908.

Field sports, when they are encouraged by the state and properly regulated so as to provide for the individual handling of game, uniformly increase land values, since the game is an additional crop which seldom proves to be injurious, but, on the other hand, often is highly beneficial to agriculture; the game-birds destroy many injurious insects and weed seeds. Land values in Scotland have been tremendously increased by the proper management of game during the last half century, and the abandoned farm has become a serious problem in America during the same period. The shooting privileges in Scotland now yield millions of dollars, annually. The editor of the Shooting Times and British Sportsman, in presenting the figures, said that they represented the value of shootings when properly looked after, and added, "it must be borne in mind that all this money is derived from land, which, in the days of our grandfathers, produced practically nothing." Much of this money is contributed by Americans who go abroad to shoot because field sports are practically prohibited in America. Thousands of dollars are also sent abroad to purchase game for the American markets and live game-birds for propagation. This money is contributed to the foreign game farmers not only by individuals, but also by the state game officers, who purchase game and game eggs abroad, chiefly in England and Hungary. Game can be produced in abundance on the American farms provided the legal restrictions are removed. We have land in abundance and still have enough birds, even of the species which are most rare, to produce game in abundance for propagation and for the markets.

There can be no doubt that the prohibition of the sale of game, the shortening of the open season, and the limiting of the bag and the placing of other restrictions on sport, has delayed the extermination of the game. It has cost millions of dollars to bring about such results, and the amount expended for the protection of game is increasing yearly. Over a million dollars is now spent yearly by the states alone, for game-protection. It is evident that a serious mistake was made in not excepting all those who are willing to increase the game, without expense to the state, from the operation of the restrictive laws. Numerous exceptions have been made from time to time in favor of those who had game in abundance, because they looked after it properly. The exceptions, however, have not been numerous enough or broad enough to be of any benefit to the community. The right to sell game even from places where it clearly appeared to be over-abundant, almost uniformly has been denied, on the theory that the sale of game from game farms and preserves might endanger the vanishing remnants of game in the unprotected fields. In all cases, however, where the legal restrictions have been mitigated, the game has increased rapidly on preserves, and overflows to the adjacent territory. It is now well known that the danger above referred to is fanciful rather than real, and that the sale of game by responsible game farmers and their shooting tenants to licensed game dealers can easily be regulated. The loss, if any, will fall on those who do nothing. The erroneous idea that the laws should favor those who do nothing and that they should restrain those willing to do something practical, seems to be passing; and it seems also probable that simple and uniform laws, intended to encourage the increase of North American game, will be enacted in the near future. A movement to this end, which was started during the year 1908, has resulted in the formation of a society of game preserves, which has been formed for the purpose of re-studying the game laws, having in mind the interests of the farmers and the people who wish to eat game, as well as the interests of those who wish to shoot, including market gunners.

Weakness of present game laws.

The present game laws are the cause of much unseemly strife. Sportsmen and farmers are often opposed to each other. Some sportsmen denounce others who shoot more than five or some other number of birds; many denounce the game dealer, innkeeper and market gunner as common criminals, and the laws are continually changed to meet the views of those who are engaged in deciding what others should do. Meantime, the game is not properly looked after, because it does not pay to do so. The simple amendments to the game laws outlined below, if enacted, will tend to fill the markets with game, to keep people in the country, and to provide for an agreeable employment for many persons; land values will be increased, and the relations between the sportsmen and the farmers will be much improved in all places where game-preserving is undertaken. They may be made as perfectly harmonious in many places as they are now in North Carolina. Sport will be benefited by the removal of many legal restrictions which in most places make it now not worth while to keep pointers and setters or even to own a gun. There should be an end to all strife between the sportsmen and game-dealers and others who wish to sell, serve and eat game, provided the licensed game dealers are permitted to sell such game as may be legally sent to them. The benefit to the farmers, provided enough game be reared fully to supply the markets, will be very great. It may be estimated at many millions of dollars, annually, since always there is a large demand for game at excellent prices in the cities and towns of the United States and Canada. Instead of importing game for propagation and for the market, North America should provide game for export.

The North American codes of game-laws exhibit a fatal weakness since they practically prohibit the care of game by individuals, when it is certain that the game must have individual care and attention in order that it may survive in populous regions and, in fact, in all places where any shooting is done. It does not pay properly to look after the game and game-fish when they can not be taken in any quantity or during a reasonably long open season, when the chances are that the season will be closed for a period of five or ten years; when there is a certainty that game can not be sold to pay the cost of caring for it, and a certainty that in many places it can not even be taken home for consumption; when a license fee must be paid (in some cases larger than the value of the game); and, worst of all, when there is a certainty that all of these restrictions must be increased as the game diminishes, until eventually they will destroy the value of every property which is used for game. A splendid food supply is made subordinate to indifferent sport. The weakness of the game laws is indicated, further, by their lack of stability. They are subject to constant change. Each law has its numerous exceptions, which indicate that it may be wrong. The increasing exceptions permitting the game-clubs and others who have game in abundance to shoot, when shooting is generally prohibited, and some other exceptions in favor of those who look after game and increase it, suggest that these exceptions might be made uniform and universal, and extended to permit the sale of game.

Suggestions for revising game laws.

The amendments to the game laws, which in the writer's opinion would quickly restore the game to the markets and improve the condition of field sports everywhere, should provide:

(1) For the sale and transportation of game and fish for propagation under the direction of the game officers in all cases in which the consignee engages properly to look after the game and increase it.

(2) For the sale of game and fish as food from game farms and preserves[1] to licensed game dealers during a long open season.[2]

(3) For the removal of all restrictions (which appear to interfere with the increase of game) from those who look after the game and increase it. The United States Department of Agriculture now favors the removal of restrictions from those who look after the game, and it seems likely that soon the laws will be amended in many states to permit of the sensible increase and marketing of game. In the bulletin on "Deer Farming" (Farmers' Bulletin No. 330, United States Department of Agriculture), it is said that "the raising of venison should be, and is naturally, as legitimate a business as the growing of beef and mutton, and state laws should be so modified as to permit the producer, who has stocked a preserve with deer at private expense, to dispose of his product at any time under reasonable regulations either for breeding purposes or for food." The writer has maintained that all game should be so sold: "None of our state officers promise or predict that game ever again will be sold in our markets. They all seem to be unaware, paradoxical as the statement seems, that it is far easier to make the game abundant in the markets than it is to save it from extinction. Capital is always ready for a profitable industry, but often is slow to exploit a sentiment, however worthy." [See "The State and the Game," The Independent, Oct. 10, 1907; The Amateur Sportsman, Jan., 1909.]

Summary.

North America can be quickly made the largest game-producing country in the world, provided the propagation of game for sport and for profit be treated as an industry to be fostered by the state.

It is not necessary to domesticate, or even partially to domesticate, game in order to make it plentiful. Game, big and small, can be reared abundantly in a wild state, not only on lands which are now unprofitable, including the arid sage plains of the West, but also on highly cultivated farms, provided always an agreeable understanding be entered into between the sportsmen and the landowners. [For details of the form of this understanding or agreement, see the article by Prof. T. Gilbert Pearson, the state game officer of North Carolina, in The Amateur Sportsman, January, 1909.] To increase the game it is absolutely necessary to remove the legal restrictions which shorten the open season, limit the bag, prohibit the sale of game, and otherwise hamper breeders. The state should aid and not restrict those who make game plentiful. [For a recent Massachusetts statute, declaring artificially reared game to be personal property, not to be sold except during the open season, see The Amateur Sportsman, January, 1909.]

The state game departments should be conducted in the interest of all the people and not in favor of a single class, the sportsmen. Their attitude towards game-rearers should be similar to the attitude of the United States Department of Agriculture towards crop- and stock-rearers. It is foolish to insist that the regulated sale of game by game-rearers and the removal of the other legal restrictions, which prevent the sensible increase of game, would endanger the game which no one looks after. The sale of game can be regulated as easily as the sale of spirits and tobacco is regulated. Because some "moonshine" whiskey is sold, we do not prohibit the manufacture of spirits. Game is sold at very low prices during a long open season, but the sale of poached game is prohibited and prevented in England. [For a comparison of the prices for game in England and North America, see The Amateur Sportsman, December, 1908 and January, 1909.]

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[1] Dead game eventually should be declared to be personal property, and the owner of it should have the right to sell it. At present, the prices for game are so high that the temptation to shoot it illegally for the market is large: for this reason the general sale of game by those who do nothing to increase it possibly should be deferred until the game is cheap in the markets. The market gunner, however, should have the same freedom that market gunners have in England.

[2] The seasons for preserved game and (in the writer's opinion) for all game should be: for prairie grouse, August 15 to February 1; wild fowl, September 1 to February 1; partridges (quail) and other upland game, October 1 to February 1; big game, August 15 to February 1.

CHAPTER X

BIOGRAPHIES

JUSTICE TO THE PERSONS who have greatly aided in the development of a better country life in North America demands that a part of this Cyclopedia be set apart for biographical sketches. We also need these biographies for historical record. It is difficult to compile such biographies, because most of these persons have been overlooked by historians, and there is neither any standard list of names that should be admitted nor any recognized source of information as to facts. This is a commentary on the neglect that this great field of human endeavor has suffered. There are men and women who have accomplished great things for the betterment of agricultural conditions, even in work of national significance, whose names are not to be found in the standard books of biography.

This chapter is necessarily incomplete. There are no precedents. The Editor has not known how to judge what names to insert and what to omit. No doubt many worthy names have been unintentionally overlooked. The compilation is offered as the best that could be made at present, and with the hope that some searcher may use it as a starting point for a much fuller and more worthy effort.

In order that the reader may know the basis on which the selections have been made, the following explanation is inserted:

(1) About twelve hundred circular letters were sent to agricultural college and experiment station men, United States Department of Agriculture men, farmers' institute workers, officers of agricultural organizations, agricultural journals, and special lists of names, asking for suggestions as to names that should be included in a biographical section to include men of national prominence. Suggestions as to biographers were also solicited.

(2) Later a similar letter was sent specially to the directors of all experiment stations and to men who are prominent in different branches of agriculture.

(3) The following circular request was sent by the Editor to persons known by him to be familiar with the agricultural development of this country:

> The space is necessarily limited. The Cyclopedia is intended to be American in scope. Many worthy names will have to be omitted. We shall be able to include, in our space, only such Americans, not now living, as were markedly influential in setting forward Agriculture and wholesome country living and in starting new movements of national consequence, whether farmers, teachers, statesmen, investigators, editors, writers, professional men, or others, and whose influence or work may be considered to have extended beyond state or provincial borders. Persons who have had marked influence in the states and localities will naturally be recorded in state and local histories, rather than in a work like this Cyclopedia. The omission of a name from the Cyclopedia does not imply that it is not worthy of honor and recognition, but only that it does not come within the plan of the work. What names in your field would you advise to be included?

(4) In order to determine the fitness of the men suggested for mention, a similar circular was sent not only to the person who suggested the name, but also to other persons who knew the one named.

The list that was made up from the suggestions following the first letters (1) and the second letters (2) was condensed by means of the information secured through letters (3) and (4). Much personal correspondence was also conducted through many months. To make the list more nearly complete, brief extracts were made of the biographies that appear in the Cyclopedia of American Horticulture, and reference made to that Cyclopedia for fuller accounts. From all these sources, the list as it now stands was secured.

The manuscripts were secured from those who were recommended by correspondents as being the best fitted to write them; and when such persons were not suggested, the Editor was obliged to secure the information from periodicals and other prints, and from correspondence. In the majority of cases, the biographer was personally acquainted with the person of whom he writes.

Abbot, Theophilus Capen. (Fig. 119.)

Theophilus Capen Abbot, educator, president of the Michigan Agricultural College, was born at Vassalboro, Maine, in 1826. He died at Ann Arbor, Michigan, November 7, 1892. When yet an infant, his father moved to Augusta, Maine, where in the public schools the boy received his training. At the age of fifteen he entered the classical course in Colby University at Waterville, then known as Waterville College. He graduated in 1845, after which he taught for a short time in an academy, then for several years in a seminary in northern Maine. He took a course at the Bangor Theological Seminary in preparation for the ministry. On the completion of this course he entered the faculty of his college as teacher of Greek, where he continued for a year and a half. He then went abroad, spending about a year in England and Scotland, studying their history, literature and people. Soon after his return to America, he went to Michigan, in 1856. He taught for a few months in Berrien Springs, then accepted the principalship of the high school in the city of Ann Arbor, at that time one of the most important educational positions in Michigan. Here he met Miss Sarah Merrylees, preceptress in the school, who, in 1860, became his wife.

Fig. 119. Theophilus Capen Abbot

During his first year at Ann Arbor he was called to the chair of English Literature at the Agricultural College. In 1858 he entered on his new duties, where the remainder of his life work was to be done. In 1866 he was transferred to the chair of logic and mental philosophy which he held until his death. From 1858 to 1861 he was treasurer of the college. From 1861 to 1863 he was secretary of the Board of Control. In 1863, he was chosen president of the college. For twenty-three years he controlled its policy and guided its fortunes. In 1885, broken in health, he was relieved from the presidency, but continued his work in logic and mental philosophy. His release from duty was too late, and his health gradually failed until his death.

President Abbot was a man of large organizing ability, courage in the face of difficulties, honorable in all his dealings. His patient and faithful service, combined with the finest standards of scholarship, had great effect on his students. He was a sympathetic friend and adviser, and won the greatest loyalty from all who knew him. He exerted great influence in maintaining and directing the ideals of education in the early formative period of the development of American colleges of agriculture.

Adams, Dudley W. By *E. O. Painter.*

Dudley W. Adams, horticulturist, was born in Winchedon, Mass., in 1831. He died at Tangerine, Fla., February 13, 1897. His father died when he was four years old, and his education devolved on his mother, who gave him a careful home training and such education as a district school at that time afforded. Later, by teaching at intervals, he was able to take an academic course. When he reached his majority, he went West, and was one of the first settlers at Waukon, Allamakee county, Iowa, where he was prominent in both city and county affairs. He had fitted himself for a surveyor, and his services were widely sought for. He was elected assessor for the county and served in that capacity for ten years.

Mr. Adams showed his love for horticulture very early, and in 1854 was chosen president of the County Agricultural Society, which was organized at that time. In 1856, he entered the horticultural work commercially and founded the "Iron Clad Nursery" of Waukon. He was secretary of the State Horticultural Society of Iowa for five years. In 1871, with one hundred varieties he took the sweepstake prize for the largest and best display of apples, and again in 1879 he took the sweepstake with one hundred and seventy-two varieties of apples. Both these exhibitions were given by the State Horticultural Society of Iowa.

In the West, Mr. Adams is undoubtedly best known as a grange organizer. In 1869, he effected the organization of the Waukon Grange, Patrons of Husbandry. In 1873, he was made master of the National Grange. At that time there were about 1,200 subordinate granges, but at the end of his term of three years there were nearly 2,200 granges distributed over the states and territories.

Mr. Adams can be truthfully called the father of railroad freight-rate legislation. He was the author of the first bill that was presented in the United States Senate, and it became a law in the state of Iowa. The corporations fought it, declaring it to be unconstitutional, but it stood the test of the state courts and the Supreme Court of the United States.

Mr. Adams went to Florida in December, 1875, and planted an orange grove and fruit trees. In 1888, with a few friends, he organized at Ocala the Florida State Horticultural Society, and was elected president, which office he held until his death. The society has now passed its twenty-first year and stands as one of the most influential horticultural bodies in the South, due largely to the broad foundation laid by Mr. Adams and his friends.

Adams, Henry Cullen. See page 427.

Adlum, John.

John Adlum, vineyardist, was born in York, Pa., April 29, 1759. He died at "The Vineyard," two miles from Georgetown, D. C., March 1, 1836. He was the son of Joseph and Catherine Adlum. At the age of fifty-four, he married his cousin, Margaret Adlum. They had two children. They lived several years near Havre de Grace, Md., and then for some time in Montgomery county, Md. Their last change of residence was to "The Vineyard," where Adlum began the cultivation of grapes. Mrs. Adlum died July 16, 1852.

John Adlum was a soldier in the Revolution, a major in the Provisional Army during the administration of the elder Adams, and later a brigadier-general in the militia of Pennsylvania. He was also a surveyor, and in 1789 was directed by Surveyor-General Lukins to survey the reserved tracts of land at Presque Isle (Erie), LeBoeuf, and elsewhere. The same year he was appointed by the government a commissioner for examining the navigation of the Susquehanna river, and subsequently, with Benjamin Rittenhouse, to examine the Schuylkill river. On various occasions, he met Indian tribes on public business. He at one time lived at Muncy, and assisted in making an early map of Pennsylvania. On April 14, 1795, he was appointed by Governor Mifflin one of the first associate judges of Lycoming county, and resigned February 16, 1898, because of contemplated change of residence.

Major Adlum may be considered the pioneer nurseryman in the District of Columbia. He merits our attention in three respects,—for his perception of the general fact that American grape-culture must be built on the improvement of our native species; for his attempt to establish an experiment station; and for the introduction of the Catawba grape. In his vineyard at Rock Creek, D. C., he planted both imported and native varieties of grapes, but finally discarded the foreign kinds as unnecessary to the development of successful grape-culture in America. He applied to the President of the United States for a tract of land to establish an experimental farm. Refused, he made his own farm as much of an experiment station as his limited funds allowed. From Mrs. Scholl, Clarksburg, Montgomery county, Md., he secured cuttings of the grape which he called Tokay,—in 1828 called by him Catawba. He grew the grape in his own vineyard, and sent cuttings of it to various other persons, bringing it prominently to the attention of vineyardists. He discusses it in his book, Adlum on Making Wine, published in 1826, second edition in 1828. In 1823, he had published "A Memoir on the Cultivation of the Vine in America, and the Best Mode of Making Wine."

Major Adlum has been described as being a tall, stout, muscular man, and very active in his movements. He had blue eyes, light hair, florid complexion, and a smooth-shaven face. He was very benevolent, and loved to aid the needy and unfortunate. [For picture, see Plate II, Cyclopedia of American Horticulture.]

Alexander, Robert Aitcheson. By *H. H. Wing.*

Robert Aitcheson Alexander, stock-breeder, was born at Frankfort, Ky., of Scottish parents, October 25, 1819. He died on the estate known as Woodburn Farm, near Lexington, Ky., December 1, 1867. The elder brother of his father was the owner of the famous estate known as Airdrie, near Glasgow in Scotland. At the age of seventeen Mr. Alexander was sent to England by his father to be educated, with the idea that he should succeed to the family estate of Airdrie. He was graduated at Trinity College, Cambridge, and about 1842 succeeded his uncle as the owner of the Airdrie estate. In 1851, he visited America and purchased Woodburn Farm of his brothers and sisters, who had inherited it from their father.

Mr. Alexander had already been more or less successful as a Shorthorn breeder in Scotland, and, in 1853, he made his first importation to America. This importation included, among other famous individuals, the cow, Duchess of Athol, and the bull, Duke of Airdrie, half-brother and sister, decended from the famous Bates-Duchess family. The importation was taken to Woodburn Farm and there successfully bred for many years, the two animals above named leaving a very numerous progeny of high quality, that became well known through the central West. Afterward, Mr. Alexander bought the famous race horse, Lexington, and from him was equally successful in breeding running horses. He also bred trotting horses with considerable success, and used as sires the famous animals, Edwin Forrest, Pilot Jr., Alexander's Abdallah and Harold, from whom were descended Maud S., Jay Eye See, and many other famous trotting animals.

Intimately associated with Mr. Alexander through almost his entire career, and his successor at his death, was his brother A. J. Alexander. By the establishment and development of Woodburn Farm, and by maintaining and successfully breeding high-class herds and flocks, the Alexander brothers contributed largely to the interest in improved live-stock of all kinds, and the advancement of American country life.

Allen, Fordyce Almon. By *Fred W. Card.*

Fordyce Almon Allen, educator, was born in Cummington, Mass., July 10, 1820, and died at Mansfield, Pa., February 11, 1880. His early education was limited to the common schools of Massachusetts, Ohio and New York, and a single year at a classical school at Alexandria, N. Y. His life was spent largely in educational work. In the fall of 1864 he became principal of the Mansfield (Pa.) State Normal School, resigning five years later to take up teachers' institute work, which he conducted in Wisconsin, Maine, Vermont, Mississippi, Virginia and Louisiana. In 1867, he organized the Soldiers' Orphan School in Mansfield, and had charge of it until his death. He was again made principal of the Mansfield Normal School in 1877, which position he held at the time of his death. He was an ardent temperance advocate, and was largely responsible for securing the passage of a law which prohibits the sale of liquor within a radius of two miles of this school. He was a man of sterling worth, much beloved by his pupils, and one who had marked ability in inspiring them to make the most of themselves.

Professor Allen took a deep interest in agriculture. In connection with the Soldiers' Orphan School he conducted a farm on which the boys were detailed to regular work and taught the practical operations of farm work. The point of greatest interest in connection with his service to agriculture, however, lies in the fact, that during his second term as principal of the Mansfield State Normal School, he organized in that institution a volunteer class in agriculture. No definite course of study was pursued for, indeed, back in the seventies the teaching of agriculture was for the most part in its primitive stages. Probably no great amount of information was imparted, for the strength of this man lay in imparting inspiration rather than information, and his wide range of knowledge often made his talks about outside matters of greater importance than his treatment of the particular subject in hand. That informal class in agriculture was an early beginning in the current for agricultural education which is now sweeping on at flood-tide. Professor Allen returned from a state agricultural meeting at Harrisburg, the week before he died, with the illness from which he failed to recover.

Alvord, Henry Elijah. (Fig. 120.)

Major Henry Elijah Alvord, soldier, educator, Chief of the Dairy Division, United States Department of Agriculture, was born in Greenfield, Mass., March 11, 1844. He died at St. Louis, Mo., October 1, 1904. He prepared for college in the schools of his town, and entered Norwich University early in the spring of 1860; took the civil engineering course, and gave special attention to branches applicable to architecture. Near the close of his junior year he joined the students' company of cavalry as a private, and soon became first sergeant. When the company (Seventh Squadron Rhode Island Cavalry) was mustered out, soon after the battle of Antietam, he returned to the university, and on graduating received the degrees of B.S., C.E., and, later, LL.D. Again he entered the Army, accepting a commission as Second Lieutenant in the Second Regiment of Massachusetts Cavalry Volunteers, and served actively in Virginia until the close of the war, at which time he held the rank of major. For more than a year he was an officer of the Freedman's Bureau under General Howard, being on duty in Virginia and South Carolina. Upon enlargement of the Regular Army in 1866, he was appointed First Lieutenant in the new Tenth Regiment of Cavalry, and was Adjutant of that regiment during its organization, and promoted Captain in 1867. He remained in the Army about five years, during which he served in Kansas, Texas, and the Indian Territory, and was part of the time on staff duty as inspector under General Hancock, and chief engineer of the field headquarters of General Sheridan. In 1869, he was detailed as military instructor at the Massachusetts Agricultural College, being the first army officer detailed to an agricultural college for this service.

In 1871, Major Alvord resigned from the Army. During the eight years following, while engaged as instructor in the scientific department of Williston Seminary, at East Hampton, Mass., he found time to pursue work in dairying and breeding of dairy cattle, which subjects were more to his taste, and by his writings and public addresses gained considerable reputation as an agricultural expert. It was during this time that he wrote the American chapters of Sheldon's Dairy Farming, which was one of his best works. In the early days of the Chautauqua movement he was in charge of the agricultural branch of its reading courses, known as its "school of farming," which was probably the first correspondence course in agriculture undertaken in this country.

Fig. 120. Henry Elijah Alvord.

Major Alvord was the pioneer in establishing the coöperative system of dairying in the United States, and established the first creamery east of the Hudson river and was the leading spirit in organizing many throughout the New England states.

In 1880, he became manager of the Houghton Farm Experiment Station, remaining at its head until the project had to be abandoned in 1885 for lack of funds. In that year he was appointed professor of agriculture at the Massachusetts Agricultural College, where he remained for two years, resigning in 1887. He was elected director of the experiment station at Cornell University on its establishment under the Hatch Act, but declined the position to accept the presidency of the Maryland Agricultural College. He organized that institution and established the experiment station, occupying the position of president and director until 1892. He was afterwards temporarily in charge of the Oklahoma Agricultural College and Experiment Station, and went from there to the New Hampshire Agricultural College in 1894 as a professor of agriculture, where he remained for a short time.

He was prominently identified with Federal legislation relating to agricultural colleges and experiment stations, and in the formation of the Association of American Agricultural Colleges and Experiment Stations. Major Alvord was the first chairman of the executive committee, which office he held for eight years. He was president of the Association of American Agricultural Colleges and Experiment Stations in 1894.

On the creation of the Dairy Division in the United States Department of Agriculture, July 1, 1895, Major Alvord was appointed chief. He organized this division and its work and was at its head at the time of his death. He had rare ability as an executive, doubtless due in part to his experience as a military officer. He was abroad in 1900 as a representative of the Department at the Paris Exposition, and was a member of the international jury of awards. At the time of his death he was in attendance at the St. Louis Exposition, where he had been busily engaged on the jury of awards. He was stricken with paralysis on the afternoon of September 28, and lingered in the hospital until October 1, when he died.

Major Alvord made many addresses before State dairy meetings and contributed articles to the annual agricultural reports of various States and to American and foreign dairy journals. While in the Department he wrote a number of bulletins on timely dairy subjects. He held membership in a number of scientific and dairy associations in this country and abroad, among which may be mentioned the American Association for the Advancement of Science, the American Statistical Association, and the National Geographic Society. He was medalist of the Royal Agricultural Society of England and the British Dairy Farmers' Association, and an "officer" of the National Order Merite Agricole of France.

His genial nature and cordial manners won for him a very wide circle of friends. He was generous, modest, and extremely unselfish, seldom striving for personal recognition.

Soon after the Civil war, he married in Fairfax county, Va., and made his residence for some time on a large farm ten miles west of Washington City, where Mrs. Alvord was born, and which was the homestead of her family for more than a century. [Adapted from Memoir in 21st Annual Report, Bureau of Animal Industry, 1904.]

Ames, Frederick Lothrop.

Frederick Lothrop Ames, horticulturist, was born June 8, 1835 in North Easton, Mass. He died September 13, 1893. He gained distinction for his wide and accurate knowledge of tropical orchids and their cultivation, and his collection of these plants was the most complete in the New World. His important services to botany and horticulture are commemorated in *Lælia Amesiana, L. anceps* var. *Amesiana, Phalænopsis, F. L. Ames, Cypripedium Amesianum, C. insigne* var. *Amesianum, Vanda Amesiana, Stanhopea Amesiana, Miltonia vexillaria* var. *Amesiana, Odontoglossum Rossiæ* var. *Amesiana*, and *Cattleya Hardyana* var. *Amesiana*. [For additional notes, see Cyclopedia of American Horticulture, page 57.]

Appleseed, Johnny. See Chapman, John.

Arnold, Lauren Briggs. By *H. H. Wing.*

Lauren Briggs Arnold, farmer, investigator and writer, was born August 14, 1814, and died March 7, 1888. As a young man he had only limited means and opportunities for education, but nevertheless became successful as a teacher. The desire for education was so great, after teaching for several years, that he prepared himself for Union College, from which he was graduated in 1843. He had expected to engage in teaching as a life work, but his father prevailed on him to take charge of a farm, which he operated until 1861. During this time he devoted much of his energy to investigating various problems, particularly in dairying, and was instrumental in organizing the Little Falls Farmers' Club, before which he read many essays giving the results of his investigations. He was the first to attempt to establish rational dairy practice on sound principles, and worked continually along this line, not only in matters pertaining to the manufacture of butter and cheese, but as well in all that pertained to the care and feeding of the cow.

In 1876, Mr. Arnold published "American Dairying," a book which at once took the front rank in its field, and which embodied the principles that he had discovered. While later investigations have shown that many supposed principles elucidated in this book were not founded on fact, still the book marked a distinct era in the development of modern dairy practice. Mr. Arnold's later investigations were largely in cheese-making, and he developed several methods of practice which were of use in making a better and more uniform grade of cheese. In the later years of his life, he spent much time in teaching these principles to cheese-makers, principally in Canada. He was one of the first to give consecutive dairy instruction in agricultural colleges, and as early as 1879 gave courses of lectures in Cornell University and the Massachusetts Agricultural College.

Mr. Arnold was a patient and painstaking investigator, a broad-minded, liberal man, and he may be looked on as the pioneer in dairy instruction and investigation in America.

Atherton, George W.

George W. Atherton, president of the Pennsylvania State College, was born at Boxford, Mass., June 20, 1837. He died at State College, Pa., July 24, 1906. He was left fatherless at the age of twelve, and supported himself, his mother and sisters, by work in a cotton mill, on the farm and by teaching. He worked his way through Phillips Exeter Academy, and in 1860 entered the sophomore class at Yale. At the outbreak of the Civil war he was commissioned first lieutenant in the Tenth Connecticut Volunteers. Leaving the army in 1863, owing to ill health, he graduated from Yale with his class. On Christmas of the same year he was married to Frances D. W. Washburn, who, with four children, survived him. For the following four years he was professor in the Albany Boys' Academy, and for the succeeding year a professor, and during most of the year acting principal, of St. John's College, at Annapolis, Md.

In 1868, Mr. Atherton was called to the Illinois Industrial University, now the University of Illinois. The year following he accepted a call to the chair of Political Economy in Rutgers College, where he remained for fourteen years. In 1873, he was a member of the board of visitors to the United States Naval Academy; in 1875, he was on the commission to investigate the charges of corruption at the Red Cloud Indian Agency, preferred by Prof. O. C. Marsh, of Yale; in 1876, he was the unsuccessful candidate from his district of the Republican party for Congress; in 1878, he was chairman of a commission to prepare and present to the legislature of New Jersey a digest and revision of the state system of taxation. In 1882, he accepted the presidency of the Pennsylvania State College, which, for twenty-four years, he directed with remarkable success. He was active in securing the passage of the Hatch Act, in 1887, and of the Second Morrill Act. On the organization of the American Association of Agricultural Colleges and Experiment Stations, he was made its first president. In 1887, he was appointed by Governor Beaver, chairman of a commission created by the legislature of Pennsylvania to make inquiry and report on the practicability of introducing manual training into the public school system. The report of this commission attracted international attention. In 1895, he was appointed member of the College and University Council of Pennsylvania, of which he remained a member until his death.

Mr. Atherton had the courage and poise of the born leader of men. He was an optimist in the best sense, believing profoundly that right is stronger than wrong, and that high and worthy ideals must ultimately triumph. [Adapted from Memorial by H. P. Armsby in Bulletin No. 184, Office of Experiment Stations, United States Department of Agriculture.]

Atwater, Wilbur Olin. (Fig. 121.)

By *C. F. Langworthy.*

Wilbur Olin Atwater, educator, agricultural chemist, the son of a Methodist clergyman well known in New England, was born in Johnsburg, N. Y., May 3, 1844, and died at his home in Middletown, Conn., September 22, 1907. He received his academic training at the University of Vermont and Wesleyan University, Middletown, Conn., being graduated from the latter institution in 1865. During a period of post-graduate study at Yale University, which led to the doctor's degree in 1869, he was especially interested in agricultural chemistry. From 1869 to 1871, he studied agricultural and physiological chemistry in the universities of Leipzig and Berlin. His career as a college teacher began immediately after his return from Europe at the University of Tennessee and Maine State College, and he was called to Wesleyan University in 1873, where he held a professorship of chemistry for over thirty years.

The first state agricultural experiment station in the United States was organized, largely through his efforts, in Connecticut in 1875, and he was made its first director and retained this position for fourteen years. Of special interest in this period are Professor Atwater's studies of the acquisition of atmospheric nitrogen by plants, begun several years before the establishment of the station, and continued as a part of its work from 1888 to 1892. Interest in the experiment-station movement spread rapidly, and the passage by Congress, in 1887, of the Hatch Act made possible the establishment of such a station in every state and territory. The establishment of the Office of Experiment Stations in the United States Department of Agriculture, as a central agency for promoting the interests of the experiment stations, naturally followed, and Professor Atwater was made its first director.

A long list of articles in scientific and popular journals, in publications of the Connecticut Storrs Experiment Station and the United States Department of Agriculture, show the contribution that Professor Atwater made to the development of agricultural chemistry, animal nutrition and agricultural education.

Parallel with his studies in agricultural chemistry, Professor Atwater began early in his career to conduct investigations in physiological chemistry with special reference to problems of human nutrition. Among his more important earlier works may be mentioned "Studies of Chemical Composition and Nutritive Value of American Food Fishes and Invertebrates," undertaken for the United States Commissioner of Fish and Fisheries, and the dietary studies and other investigations undertaken for the Smithsonian Institution and the Massachusetts Bureau of Statistics of Labor. In this and later work, experimental methods for the study of nutrition problems were evolved, and lines of research outlined which have become generally adopted.

In 1882–3, he devoted considerable time, at the universities of Munich and Heidelberg, to familiarizing himself with German methods of studying nutrition problems, and later made the study of human nutrition an important part of the work of the Storrs Agricultural Experiment Station. In 1894–5, Congress made special appropriations for nutrition investigations under the auspices of the Office of Experiment Stations of the United States Department of Agriculture, and the extended series of publications which have reported this work shows what a large contribution Professor Atwater and his associates have made to this important subject.

Familiarity with the Pettenkofer-Voit respiration apparatus, gained during his stay at Munich, led Professor Atwater to undertake the construction of a similar device, which, however, should include the determination of income and outgo of energy in addition to the income and outgo of matter; and the respiration calorimeter, which was developed by him and his associates, is unrivaled in its class as an instrument of precision, useful for the study of a very large variety of problems connected with physiology and nutrition of man and animals. The bomb calorimeter and the methods of its use, also were materially improved under his direction.

Fig. 121. Wilbur Olin Atwater.

In the study of nutrition problems, Professor Atwater's aid was often sought. As instances, may be mentioned the extended investigations of dietetic problems undertaken for the New York State Commission in Lunacy, studies of the nutritive value of alcohol conducted for the Committee of Fifty to Investigate the Liquor Problem, and the series of investigations undertaken for the Carnegie Institution of Washington.

Professor Atwater was a member of many learned societies, and received many honors in the United States and Europe. His influence on the development of agricultural education and research in this country and on the study of human nutrition has been of very great and permanent value.

Atwood, Stephen. By *H. H. Wing.*

Stephen Atwood, sheep-breeder, was born April 14, 1785, at Woodbury, Conn. He died February 5, 1867, having lived on the farm on which he was born during his whole life.

Fine-wool or Merino sheep from Spain were introduced into the United States at the beginning of the nineteenth century, the most important introductions of which were known as the Humphrey and Jarvis importations. Mr. Atwood became interested in these sheep, which had been introduced into his neighborhood, and, in 1813, he purchased an especially good ewe, known to have descended from the Humphrey importation, for $120. From this beginning, he continued to breed with great care and skill during the remainder of his life. Merino sheep were numerous in his neighborhood, and, for a number of years he used the best rams that he could find among his neighbors. His skill in breeding was such, however, that his flock soon took a leading position in the neighborhood, and after 1830 he did not go outside of his own flock for fresh blood. He was eminently successful in increasing the size of the sheep and the weight of the fleece, and his skill in selecting had intensified these characteristics to such a degree, that they were transmitted to other flocks with a great degree of regularity. This led to the selection of sheep of Mr. Atwood's breeding by many other breeders, and in this way they became widely scattered in the fine-wooled flocks of the United States.

Mr. Atwood lived on a comparatively small farm, and never had a very large flock. His care in selection and management was such as to give this flock a distinctive character and to enable individual animals to impress these characters on other flocks, wherever they were sent. Following Mr. Atwood's death, a number of breeders of sheep descended from his flock organized an association known as the Vermont Atwood Merino Sheep Club, to perpetuate the qualities of the Atwood sheep by means of flock registration and otherwise.

Balentine, Walter. By *Mrs. E. A. Balentine.*

Walter Balentine, educator and investigator, was born in Waterville, Me., September 21, 1851. He died February 25, 1894. He fitted for college in the Waterville Classical Institute, and was graduated from the Maine State College, now the University of Maine, in 1874, with the degree of B.S. After graduation, he accepted a position as assistant to Professor W. O. Atwater in the Connecticut State Experiment Station at Middletown, and did graduate work in Wesleyan University, where he remained for two years, with the exception of four months, during which time he filled a vacancy in the faculty at the University of Kansas. The degree of M.S. was awarded him in 1884. In 1878, he went to Germany for further study, where he spent one year at Greifswald, working chiefly in organic chemistry under Professor Limprecht, and another year at Halle, as assistant in the Halle Experiment Station.

On his return to America, he was engaged for a year on the investigation of certain sugar problems for the United States Department of Agriculture, and then accepted a position as Instructor in Agriculture in the Maine State College. He was promoted to be Professor of Agriculture in 1883, and held this position until his death. In addition to his duties as a teacher, he had for a time the charge of the college farm. On the establishment of the Maine Fertilizer Control and Experiment Station, he was appointed Acting Director, and organized its work, serving as agriculturist to the Maine Agricultural Experiment Station from its establishment until his death.

Born on a farm, brought up to be familiar with its practical affairs, he was equipped by early surroundings, as well as by temperament and training, for his work in agricultural education and investigation. He began his work at a time when agricultural education was little understood, and his tact, as well as his ability and hard work, did much to advance its interests in the state of Maine. He won the confidence of the agricultural people, and had their hearty coöperation in his efforts. He was a member of the State Board of Agriculture and active in its affairs. He was an earnest worker, sacrificing himself for the benefit of others.

Barnard, William Stebbins.

William Stebbins Barnard, scientist, entomologist, was born at Canton, Ill., February 28, 1849. He died at Des Moines, Iowa, November 13, 1887. He received a splendid schooling, attending the Canton High School, University of Michigan and Cornell University. He was graduated from Cornell in 1871, with the degree of Bachelor of Science. He then went abroad and studied at Jena and Leipzig, getting his Ph.D. degree in 1873. On his return to America, he became a lecturer at Cornell (1874); at the summer school on Penikese Island (1874); Mississippi Agricultural College (1874–75); Illinois Teachers' Summer School (1875); Wisconsin State Normal School (1875); Oskaloosa College (1876–78); Cornell University (1878–80). He then became entomologist of the United States Department of Agriculture for five years (1880–85). In 1886, he was lecturer at the Drake Christian University.

Mr. Barnard was also of an inventive turn of mind. He designed corn and cotton harvesters, appliances for the destruction of injurious insects, paper file-holders, the Harvard book-rack. To illustrate his many writings on entomological and other subjects, he prepared hundreds of plates and figures, some of them on stone. [Adapted in part from The National Cyclopedia of American Biography.]

Barnes, Phinehas. By *S. L. Boardman.*

Phinehas Barnes, editor, was born in Orland, Maine, January 26, 1811. He died at Portland, Maine, August 25, 1871. He fitted for college at Phillips Academy, Andover, Mass., and graduated from Bowdoin in 1829. In 1833, he was editor of a newspaper published in Bangor, and from 1836 to 1839 was professor of Greek and Latin in Waterville college. In 1841, he assumed the editorship of the Portland Advertiser, the oldest newspaper in the state, and remained in that position for several years.

In 1866, Mr. Barnes, who had studied carefully agricultural education questions, published a series of articles in a leading state newspaper on "The Colleges for the Industrial Classes, Contemplated by the Act of Congress." This treatise, which was reprinted in pamphlet form, was a more intelligent and thorough examination of the subject than had ever been presented to the people of Maine. He insisted that the course of instruction at the new colleges should be such that the graduates from them, from design and choice, would continue to be laborers,—educated men and hand-laboring men at the same time. It was no doubt the writing of this pamphlet that caused the trustees of the State College of Agriculture and the Mechanic Arts, now the University of Maine, at a meeting held January 22, 1867, to elect Mr. Barnes to the presidency of the new college. Through some disagreement with the trustees as to the character and policy of the new institution, Mr. Barnes did not accept the position.

Barry, Patrick. By *W. C. Barry.*

Patrick Barry, nurseryman, writer, editor, was born near Belfast, Ireland, May 24, 1816. He died on the 23d day of June, 1890. He received a liberal education, and at the age of eighteen became a teacher, for two years, in one of the Irish national schools. In 1836, he came to New York, and shortly after his arrival was offered a clerkship by the Princes, celebrated nurserymen of the period, at Flushing, Long Island, which he accepted. He remained with them for four years, during which time he acquired a practical knowledge of the nursery business. In 1840, he removed to Rochester, and in July of that year formed a partnership with George Ellwanger, which continued to the time of his demise. The firm of Ellwanger & Barry, "The Mount Hope Nurseries," established on seven acres of ground, as a beginning, a business that is now of vast extent and world-wide fame.

At the same time, Mr. Barry was busy writing on horticultural subjects. Following many miscellaneous contributions to the literature of that particular field, in 1852 he published his first popular work, The Fruit Garden. The edition was soon exhausted, and another and larger one followed in 1855. In 1852, The Horticulturist passed from the hands of Luther Tucker into those of James Vick, and was removed from Albany to Rochester in order that Mr. Barry might be editor. He conducted it for several years and until its purchase by Messrs. Smith, of Philadelphia. Mr. Barry's chief and most valuable work, however, was his "Catalogue of the American Pomological Society," which is the accepted guide of American fruit-growers, and is regarded as standard authority throughout the world.

For more than twenty years, Mr. Barry was president of the Western New York Horticultural Society, which is the most prosperous and important society of its kind in the United States. He was president of the New York State Agricultural Society and a member of the board of control of the New York State Agricultural Experiment Station. At times he filled offices of importance to the local community, such as alderman of the city and supervisor of the county, and as frequently declined the tender of others. He was president of the Flour City National Bank, president of the Mechanics' Savings Bank, president of the Rochester City & Brighton Railroad Company, president of the Powers Hotel Company, president of the Rochester Gas Company, a trustee of the Rochester Trust & Safe Deposit Company.

Mr. Barry was married, in 1847, to Miss Harriet Huestis, a native of Richfield, Otsego county, New York. Eight children were born of this union, six sons and two daughters. He was an upright man, a model of industry, integrity and honor. As long as fruit-growing remains an industry of the country, his memory will be cherished as the promoter of valuable knowledge on the subject. [For additional notes and picture, see Cyclopedia of American Horticulture, page 132 and Plate II.]

Bartram, John.

John Bartram, botanist, was born at Marple, near Darby, Pa., March 23, 1699. He died September 22, 1777. He established the first botanic garden in America at Kingsessing, on the Schuylkill river. This garden is a unique spot in America. He was for years the chief medium of exchange between Europe and America of plants of all kinds, especially new and important species. He was perhaps the first American to perform successful experiments in hybridization. He is commemorated in Bartramia, a genus of mosses, and in "Bartram's Oak." [For fuller notes, see Cyclopedia of American Horticulture, page 133.]

Bateham, Marshall B. By *W. J. Green.*

Marshall B. Bateham, horticulturist, writer, editor, was born in England, September 13, 1813, and died in Painesville, Ohio, August 5, 1880. The early part of his life was spent at Rochester, New York, where he was engaged in the seed business and in editing the Genessee Farmer. He left Rochester in 1843 and went to Columbus, Ohio, where he published the Ohio Cultivator from 1845 to 1850, and was also engaged in the nursery business. He was one of the organizers of the Ohio State Board of Agriculture, and was its first secretary, which office he held without compensation. In 1852, he helped to organize the Ohio Pomological Society, which afterward became the Ohio Horticultural Society. He was secretary of this society until his death.

Mr. Bateham's bent was distinctly horticultural, and his early life at Rochester gave abundant opportunity to develop in this direction. His work as secretary and editor shows that he took broad views and did not limit his efforts to the narrow field of a specialist. His greatest influence was exerted as a writer, both as an editor and as a contributor. He had the faculty of estimating the value of the work of others. He took a leading part in the pomological discussions at horticultural meetings. He helped greatly in clearing up the nomenclature of varieties and in forming estimates of their value. Many of the younger men who are now well known in horticultural circles received inspiration from him.

Beardshear, William Miller. By *L. H. Pammel.*

William Miller Beardshear, minister of the gospel and educator, was born at Dayton, Ohio, November 7, 1850. He died August 5, 1902, at Ames, Iowa. His boyhood was spent on the farm, and his early education was secured in the public schools of Ohio. At fourteen years of age he entered the army of the Cumberland. In 1876, he received the degree of Bachelor of Arts from Otterbein University and later received the degrees of Master of Arts and Doctor of Laws from the same school. He took two years of post-graduate work at Yale University. He was a minister of the United Brethren church, and held pastorates at Arcanum and Dayton, Ohio. He was president of Western College, Toledo, Iowa, from 1881 to 1889, and at the time was one of the youngest college presidents in the United States. He brought Western College from an obscure institution to one of standing among the colleges of the state. He was superintendent of the city schools of Des Moines from 1889 to 1891, in which position he displayed unusual executive ability. To be a successful city superintendent requires tact and ability of an unusual kind, and he had both to a marked degree. He was president of the Iowa State Teachers' Association, in 1894; served a term on the executive committee of the Iowa State Teachers' Association; was director of the National Education Association from Iowa for a number of years, and was president, one year, of the Department of Manual Industry and Training of that association; president of the Iowa State Improved Stock Breeder's Association in 1889; a member of the United States Indian Commission from 1897 until the time of his death; juror on Educational Awards at the Pan-American Exposition, Buffalo, New York, in 1901, and president of the National Educational Association for the year 1901-1902.

Dr. Beardshear was an unusually strong executive. He had a commanding presence, which at once caused him to receive respectful consideration. He was careful never to commit himself to a student, and in some way got at the student's secrets personally, without the aid of others. His policies in relation to the public-school system are still commented on. He outlined policies that were not narrow or one-sided, always working for the full and complete development of the student. Mental training was not sufficient, but the social side, as well as athletics, must needs receive attention. He wished the college to turn out men and women in the broadest sense. Industrial education was uppermost with him. The state of Iowa, as well as the nation, is indebted to him for his grasp of education along agricultural lines. He was an able and convincing speaker, and delivered many addresses before college societies, educational associations, stock-breeders' meetings, and other gatherings. After his death, a representative collection of his addresses and writings, under the title, "A Boy Again, and Other Prose Poems," was published by subscription.

Beatty, Adam. By *John Lee Coulter.*

Adam Beatty, essayist and farmer, was born in 1776 and died in 1858. He was a close student of agricultural problems and in a rare degree combined the scientific and the practical. He constantly sought the latest books on agriculture, and studied them carefully with reference to American conditions. He was an importer of pure-bred live-stock. In 1844, the editor of the Western Citizen of Paris, Ky., wrote of him " . . . (he) is a gentleman of deep research, who has devoted his attention almost exclusively for years to the cultivation of the soil, and to the elevation of farming into a science."

Beatty began to contribute to the agricultural press almost as soon as there was a specialized press in the country, and in later years was a "valued and constant contributor" to the columns of the Kentucky Farmer and other papers. The theme of all his writings was American agriculture. But his reputation rests more on his deep interest in agricultural organizations, his essays on agricultural questions, his success as a farmer and his agricultural "letters." Among the more important of the latter, which later appeared in print, were the following to Thomas B. Stevenson, Esq., of the Kentucky Agricultural Society: (1) On the nature of soils and the means of rendering them fertile; (2) on the deterioration of soils and the means of renovation; (3) on the means of reclaiming and preserving the fertility of soils. The following two letters to Edmund Ruffin, editor of the Farmers' Register of Petersburg, Va., are also of interest: (1) on the importance of alkalies in soils; (2) on the relation of the constitution of soils to their fertility. Other important letters were: On food for plants, and whence derived; on the relative value of the most important grasses; on setting woodlands in grass; on making and preserving timothy meadows; on grazing and feeding cattle in Kentucky; on the cultivation of the locust; on the cultivation of wheat in rich vegetable soils; on the mode of feeding root crops to sheep. Among the foremost contributors of essays to agricultural fairs in the late thirties and early forties, we find Beatty, with such prize essays as follows: The Cultivation of Corn; Rotation of Crops; The Cultivation of Hemp; The System of Agriculture Best Adapted to Kentucky; Breeding of Horses for Agricultural Purposes; The Cultivation of Tobacco; The Advantages of Manufactures to Agriculture. In 1843, a considerable number of his miscellaneous letters and essays were published by Saxton, of New York, under the general title of "Southern Agriculture." The next year, as vice-president of the Kentucky Agricultural Society, Beatty published his "Essays on Practical Agriculture," in Kentucky.

Beecher, Henry Ward.

Henry Ward Beecher, clergyman, orator, editor, was born June 24, 1813, in Litchfield, Conn. He died March 8, 1887. He deserves remembrance for his work as editor of the Western Farmer and Gardener. A selection of his contributions was printed in 1859, entitled "Plain and Pleasant Talk About Fruits, Flowers and Farming." He wrote much on religious and related topics. [See note in Cyclopedia of American Horticulture, page 140.]

Bigelow, Jacob.

Jacob Bigelow, botanist, physician, educator, and founder of Mt. Auburn Cemetery, the prototype of all garden and landscape cemeteries, was born at Sudbury, Mass., February 27, 1787. He died at Boston, January 10, 1879. His Florula Bostoniensis (1814) was the first American local flora of importance. His American Medical Botany (1817–20), three volumes, was the first work of its kind. He was the one man without whom Mt. Auburn Cemetery would never have existed. This cemetery has been one of the most important factors in the development of landscape-gardening in America. [For fuller notes, see Cyclopedia of American Horticulture, page 161.]

Bliss, Benjamin K. By *Byron D. Halsted.*

Benjamin K. Bliss, merchant, horticulturist, was born in Onondaga, N. Y., October 4, 1818, and died at Boston, Mass., August 22, 1899. He early began his business career in Springfield, Mass., where he instituted the practice of sending seeds through the mail. In 1853, he began the series of catalogues that ultimately developed into booklets, beautifully adorned with colored plates. The firm name was changed to B. K. Bliss & Sons (Samuel B. and Elijah W. becoming partners), and an auxiliary store was opened in New York City, to which place, two years later, the whole establishment was removed and continued until 1885. Mr. Bliss had the spirit of the pioneer, combined with a rare faculty of securing meritorious novelties and skilfully making them known, among which were the "American Wonder," "Everbearing" and "Abundance" peas, "Early Rose" and "Triumph" potatoes, "Auratum," "Krameri" and "Hansoni" lilies. For several years, he was the publisher of American Garden. He was a familiar figure in horticultural meetings, particularly in New York and Boston, where his large knowledge and courteous manners made him universally admired.

Bowditch, Ebenezer Francis. By *N. I. Bowditch.*

Ebenezer Francis Bowditch, farmer, was born in Boston, November 5, 1841, and died December 30, 1891. He was a son of Nathaniel Ingersoll Bowditch and grandson of Nathaniel Bowditch, one of the most distinguished Americans. He received his education in Boston, but did not enter college, as he suffered through life from weakness of the eyes, which made study, even reading, painful to him.

When young he devoted his time to agriculture, and became prominent among the progressive farmers of the country. Early in life he bought an estate at Framingham, of about five hundred acres, which he made one of the finest farms in the country. Here he practiced his theories and made improvements in farm methods. He was practical in all his experiments, and put them to the test before recommending them to other farmers. He was a leader among those who have demonstrated the value of the corn crop to Massachusetts agriculture, especially in the use of the fodder. He showed on his own fields that the expensive hand-labor of the past was unnecessary, and that "flat culture" with the cultivator was what was required.

Mr. Bowditch made valuable experiments in the use of commercial fertilizers. He was one of the most active members of the Massachusetts Society for Promoting Agriculture, which imported Percheron horses, English sheep and swine to improve the stock of the state. He was an importer and breeder of Guernsey cattle, and had a very fine herd of his own raising. He was the largest breeder of sheep in New England, and was enthusiastic in urging his brother farmers to keep flocks.

Mr. Bowditch was a member of the State Board of Agriculture, having been elected in 1879, and took an active part in the affairs of the Board. He was a trustee of the McLean Asylum, and of the Massachusetts General Hospital. He was a man of unusual executive ability, simple, direct, honorable and genial in all relations.

Breck, Joseph.

Joseph Breck (1794–1873), seedsman and author of The Flower Garden, or Breck's Book of Flowers (1851), was president of the Massachusetts Horticultural Society (1859–1862). In 1822, he founded the seed business in Boston, now conducted under the name Joseph Breck & Sons. In 1833, he published The Young Florist. He edited the old New England Farmer and The Horticultural Register (1836–1838). [See Cyclopedia of American Horticulture, page 180.]

Bridgeman, Thomas.

Thomas Bridgeman, gardener, florist, seedsman, and author, was born in Berkshire, England. He died in 1850. He came to America in 1824, and established the business now conducted under the name Alfred Bridgeman, New York City. In 1829, he published The Young Gardener's Assistant, which was many times reprinted. [See note in Cyclopedia of American Horticulture, page 180.]

Brigham, Joseph H. By *C. E. Thorne.*

Joseph H. Brigham, soldier, farmer, Assistant Secretary of Agriculture, was born December 12, 1838, at Lodi, Medina county, Ohio, and died June 29, 1904. When he was fourteen years of age his family moved to Fulton county, Ohio, where he lived until his death. At the outbreak of the Civil war he enlisted as a private soldier in the Twelfth Ohio Volunteer Infantry, and later in the Fiftieth Ohio, in which regiment he was chosen captain, and from which he was transferred to the Sixty-Ninth Ohio, in which he rose to the rank of colonel.

At the close of the war, Colonel Brigham returned to his farm in Fulton county. He was soon elected sheriff of that county, in which office he served three terms. In 1880, he was elected to the state senate, and while in this office he secured the passage of the bill establishing the Ohio Agricultural Experiment Station. In January, 1882, he was elected a member of the State Board of Agriculture. In 1887, he was appointed a member of the Board of Control of the Experiment Station, and also a member of the Board of Trustees of the Ohio State University. He served on the Experiment Station Board until 1894, when he was appointed a member of the Board of Managers of the Ohio Penitentiary. In 1897, he was appointed Assistant Secretary of the United States Department of Agriculture by President McKinley, which position he occupied at the time of his death.

Colonel Brigham became a member of the order of Patrons of Husbandry in 1873, and served several years as Master of the Ohio State Grange, and later as Master of the National Grange. He was a man of commanding presence, being about six feet six inches tall, and correspondingly broad-shouldered. He was a ready and forceful public speaker, pleasant and approachable in manner, and of unblemished personal character. Until called to the United States Department of Agriculture, Colonel Brigham lived on one of his several farms, and personally directed the work on all of them. Although denied the advantages of a scientific education for himself, he was an ardent and intelligent supporter of every movement for the advancement of education and research in agriculture.

Brincklé, William Draper.

William Draper Brincklé, physician, amateur pomologist, was born in Delaware. He died at Groveville, N. J., in 1863, at the age of sixty-four. He produced the Cushing strawberry, the Wilder, President Cope, Cushing and Orange raspberries, and the Wilmington and Catherine Gardette pears. He was vice-president of the Pennsylvania Horticultural Society. In 1860, he edited Hoffey's North American Pomologist. [For fuller notes, see Cyclopedia of American Horticulture, page 180.]

Brown, Amos. See page 411.

Brown, Obadiah. By *William Williams.*

Obadiah Brown, farmer, breeder of Ayrshire cattle, legislator, was born in North Providence, R. I., on November 30, 1823. He died in Providence, February 2, 1907. He was a lineal descendant of Chad Brown, who went to Providence from Salem, Mass., one year after Roger Williams. He was a member of the family from which Brown University takes its name. His father was Richard Brown; his mother was Penelope Farnum, a Quaker, daughter of Joseph Farnum, of Georgiaville, R. I. His father having died at the comparatively early age of fifty-one, Obadiah, then seventeen years of age, took charge of the farm. Firm in his convictions, diligent in his business and thorough in all his work, he was a splendid example of the Puritan, without the latter's alleged intolerance. In all matters pertaining to agriculture, he was an acknowledged authority, particularly on Ayrshire cattle. The gold medals and premiums awarded to him by his own and other states were numerous. His Ayrshire stock received first premium at Madison Square Garden in 1888.

From his youth, he was identified with the Rhode Island Society for the Encouragement of Domestic Industry, and was among the first to organize the State Board of Agriculture, of which he was a prominent member until his death. It is a high compliment to the shrewdness of his neighbors and flattery to his capacity and integrity, that he was elected both as representative and senator to the legislature of the state.

He was married in 1849 to Amey Randall Angell, a member of one of the most influential families in the state. By her he had six children, of whom four daughters survive at the present writing. Obadiah Brown won the respect and esteem of all with whom he came in contact, either socially, officially, or commercially. The farm on which he was born, lived and died, is a visible evidence of his industry, intelligence and economy.

Brown, Waldo Franklin. (Fig. 122.)

By *F. C. Brown.*

Waldo Franklin Brown, farmer, writer and lecturer, was born in Worcester, Mass., October 24, 1832. He died at his home, East View Farm, Oxford, Ohio, July 8, 1907. At the age of five, he removed with his parents to Brownsville, Ind., and at the age of sixteen removed to Oxford, where he attended Miami University for a short time. At the age of about forty, he began to receive attention as an agricultural writer, and his reputation extended rapidly. He was contributor to leading agricultural periodicals, among them The National Stockman, Breeder's Gazette, Country Gentleman, and Home and Farm. He was on the editorial staff of the Ohio Farmer, and had charge of the agricultural departments of the Cincinnati Gazette and the Cincinnati Weekly Enquirer. He frequently wrote over the signature "Johnny Plowboy." He was author of Farm and Stock Cyclopedia; Success in Farming; chapter in Triumphs and Wonders of the Nineteenth Century, and The Century in Agriculture. He was lecturer on the Ohio Farmers' Institute force for years, as long as his health would permit. He served in the Civil war in the Thirty-fifth Ohio Volunteer Infantry.

Fig. 122. Waldo Franklin Brown.

Mr. Brown was a member of the Presbyterian church, an elder, and for more than twenty years a Sabbath school superintendent. He was well versed in literature. As a friend and neighbor he was highly respected; as a farmer he was progressive; as a writer he was noted. He was survived by his wife, two sons and five daughters.

Budd, Joseph Lancaster. (Fig. 123.)

By *N. E. Hansen.*

Joseph Lancaster Budd, horticulturist, teacher, investigator, was born near Peekskill, N. Y., July 3, 1835. He died at Phœnix, Ariz., December 20, 1904. His early life was spent on the home farm and in preparation for college at the Monticello Normal Institute. When ready for the sophomore year of Union College he had to give up his course. In 1857, he went to Rockford, Ill., for two years as principal of the high school and tutor of mathematics in the academy for boys.

He then started in the nursery business at Wheaton, Ill. A year or so later, he established the Benton County Nurseries at Shellsburg, Ia. He was eminently successful as a nurseryman, orchardist and general fruit-grower, and in a few years had accumulated a comfortable and independent fortune. On January 26, 1861, he married Sarah M. Breed at Iowa City; the union was blessed with two children, a son and a daughter. In 1873, he was elected secretary of the Iowa Horticultural Society, in which capacity he issued twenty-one annual volumes of horticultural reports. In 1876, he was elected to the chair of Horticulture and Forestry at the Iowa Agricultural College at Ames, which position he held for nearly twenty-two years, until he resigned, in January, 1899, owing to failing health. He was continued as Professor Emeritus until his death. Several of the last winters were spent in the South in the effort to regain health.

Professor Budd was a leader in importing hardy fruits, trees and shrubs from similar climates of the Old World, especially from European Russia. In 1882, together with Charles Gibb, of Canada, he made a trip to Russia for this purpose. Native Russian stock was imported into the United States and propagated as rapidly as possible during a period of many years, the plants being sent out for trial to many sections of the prairie Northwest and across the continent. Interest at this time in hardy plants in the northern Mississippi valley was intense, owing to the wide-spread destruction caused by the crucial-test winters of 1872–3 and 1884–5. The work gave a tremendous impetus to the betterment of prairie horticulture and has made fruit-growing possible much farther northwest than would otherwise have been the case. Professor Budd also devoted himself to improving the native fruits, especially the native plum.

Fig. 123. Joseph Lancaster Budd.

As a teacher and investigator, Professor Budd was marked by keen discrimination, boundless enthusiasm, great ingenuity and fertility of resources. He was one of the very first to hold a Chair of Horticulture in the United States. He was a fluent writer and speaker. He was a philosopher, had written excellent poetry, and was a good geologist in his early days. Moreover, he was a man of affairs, a financier of mature judgment. In his retirement, he wrote the American Horticultural Manual.

Buel, Jesse.

Jesse Buel, agriculturist and editor, was born at Coventry, Conn., January 4, 1778. He died at Danbury, Conn., October 6, 1839. He was one of the founders, in 1834, of The Cultivator. [See note, Cyclopedia of American Horticulture, page 188.]

Buist, Robert.

Robert Buist, florist, seedsman and author, was born at Cupar Fyfe, Scotland, November 14, 1805, and died in Philadelphia, July 13, 1880. He became noted for his success with roses; improved the verbena; introduced into America a distinct class of bedding plants, and introduced *Poinsettia pulcherrima* to the trade. He was author of The American Flower-Garden Directory (1832), The Rose Manual (1844), The Family Kitchen Gardener (copyrighted 1847). [See biography in Cyclopedia of American Horticulture, page 189.]

Bull, Ephraim Wales.

Ephraim Wales Bull, introducer of the Concord grape, lived a long, quiet, useful life at Concord, Mass., where he died September 27, 1895, in his ninetieth year. He rendered great service to agriculture in introducing this variety of the northern fox-grape. [See biography in Cyclopedia of American Horticulture, page 195.]

Burchard, Sylvester. By *Solomon Hoxie.*

Sylvester Burchard, a successful dairyman and well-known expert judge of cattle, was born at Remson, N. Y., in 1834, and died in 1907. His father, who was the village blacksmith, abandoned his craft in 1849 and bought a farm near Hamilton, N. Y., where he established the first large dairy herd in Madison county. His pride was the old red Durham stock, and his cows were bred from a sire brought from Kentucky. Eleven years later he died, and left the management of his estate to his son, Sylvester, then seventeen years of age. Up to this time, the ambition of young Burchard was a college course in the near-by university. However, he cheerfully gave this up and devoted his life to agriculture. He continued to improve his father's herd by a strain of blood from that of Walcott and Campbell of New York Mills, and his cows were large, splendidly formed, and good producers. In 1879, he began breeding so-called Holstein cattle. He joined the Dutch-Friesian association and became one of its leading members.

In 1882, in company with Cornelius Baldwin, of Ohio, also an expert judge of dairy cattle and the secretary of the association, Mr. Burchard went to the Netherlands to select cattle for the members of the association and to attend, as delegate, a conference of members of the Netherlands and Friesian Associations held in Amsterdam. A herd of 217 cattle was selected for shipment. As a result of the conference, in which Professor Hengerveld, of the Royal Veterinary Institute was counselor, Mr. Burchard was convinced of the wrong being done the Dutch breeders by the false origin and misleading name given their cattle in America. Although not in favor of the union of the Dutch-Friesian and Holstein Associations, he yielded to the judgment of his associates. He became a member of the conference committee that formulated the terms on which they were finally united in 1885. When, in 1894, the association was passing through difficulties which threatened its existence, Mr. Burchard was elected president, and to his wisdom and unselfish efforts in its behalf, the continued growth and prosperity of the association must be largely attributed. He assisted in formulating rules for advanced registration in both associations, and also in determining and revising the scale of points by which the cattle are graded.

Burleigh, Hall C. By *S. L. Boardman.*

Hall C. Burleigh, stock importer and breeder, was born in Fairfield, Me., December 15, 1826. He died at Vassalboro, Me., May 17, 1895. His early education was that of the common school and the farm, as his later life was that of practical experience and good business methods. In 1847, he married Mary D. Garland, of Winslow, by whom he had eight daughters and five sons. For many years he purchased live-stock for the Boston market, his fancy always having been for the larger beef-making and working breeds. For some years he was president of the Kennebec Agricultural Society, and was a member of the State Board of Agriculture in 1863–64 and in 1867–69. He was one of the first men in Maine to engage in the introduction and breeding of pure-bred stock of the Shorthorn, Hereford, Aberdeen-Angus and Sussex breeds. In 1869, he purchased the entire herd of pure-bred Herefords belonging to Hon. H. M. Cochrane, of Hillhurst, Compton, P. Q., then, and for a long time previous, regarded as the most famous herd of Herefords on the continent. In 1879, Mr. Burleigh formed a partnership with Joseph R. Bodwell, afterward governor of Maine, for the importation and breeding of Hereford cattle, which partnership was dissolved by the death of Mr. Bodwell, December 15, 1887. During the continuance of this firm, Mr. Burleigh, who was the managing partner, visited England eight times for the purpose of personally selecting the best breeding animals, bringing to America large consignments each time. In addition to these, he made eight other importations from Great Britain, aside from importations from Canada. In 1883, he chartered the steamship, Texas, and brought over the largest lot of pure-bred Herefords ever imported to this country by one firm, numbering 200 animals. At the centennial exposition in Philadelphia in 1876, Mr. Burleigh was a leading exhibitor in the cattle classes, and in the World's competition won five first prizes. In 1881, he made the tour of the grand western circuit of great interstate fairs, winning many prizes. Between 1880 and 1890, Mr. Burleigh's sales of blooded stock of his own importation and breeding are said to have amounted to more than $1,000,000. He was the foremost breeder of pure-bred cattle that the state of Maine has had. In 1891, he was appointed a member of the Maine World's Fair Commission and was chosen president of the Board. Mr. Burleigh was a member of the state legislature in 1889–90, and was elected by the legislature a member of the state board of assessors in 1892, which office he held until his death. He was a leading member of the order of Patrons of Husbandry.

Caldwell, George Chapman.

George Chapman Caldwell, chemist, was born August 14, 1834, at Framingham, Mass. He died at Ithaca, N. Y., September 5, 1907. He was the son of Jacob and Mary Ann (Patch) Caldwell. His opportunities for education were good, in the schools of New Hampshire and Massachusetts. In 1851, he entered Harvard, in the chemical laboratory of the Lawrence Scientific School. After graduation in 1855, he took advanced work in Germany, spending two years (1855–57) in the Wohler laboratory at Göttingen, and one year (1857–58) in the Bunsen laboratory at Heidelburg. In 1861, he was married, at Yellow Springs, Ohio, to Rebecca Stanley Wilmarth. He then was appointed (1859–60) assistant professor of chemistry at Columbia college. From here, he was appointed professor of chemistry, physics and botany in Antioch College (1860–62). In 1862–64, he was chief clerk and hospital visitor, United States Sanitary Commission. In 1864 he went to Pennsylvania State College as professor of chemistry, and was later (1867) appointed vice-president of the college. On the establishment of Cornell University, he received an appointment, in 1868, as professor of agricultural and analytical chemistry, which position he held until just before his death. In 1903, he became professor emeritus. He was instrumental in the organization of the Society for the Promotion of Agricultural Science. For some time he was president of the Association of Official Agricultural Chemists. He was a Fellow of the American Association for the Advancement of Science, and vice-president of the society in 1881. In 1892, he was president of the American Chemical Society.

Campbell, George Washington. By *W. J. Green.*

George Washington Campbell, horticulturist, was born January 12, 1817, in Cortland county, New York. He died in the month of August, 1897. In 1822, he was taken, with his family, to Sandusky, Ohio, and in 1849 he removed to Delaware, Ohio. While living at Sandusky, he became interested in the cultivation of the grape, which was becoming the predominant horticultural industry of that region, and he is said to have been the first to bring into cultivation some of the native grapes. In Delaware he engaged in mercantile pursuits, although still retaining his interest in horticultural matters, an interest which led him, in 1857, to retire from mercantile business and devote himself exclusively to horticulture. He was the introducer of the Delaware grape, a variety the great value of which made him famous throughout the realm of American horticulture. He originated numerous other varieties, among them Campbell's Early, which he considered the most valuable of his productions. His great work was the improvement of the native grape, to which he gave his chief energies. His standard of excellence was so high that he discarded many promising seedlings that others would have considered worthy of propagation. He became widely known as an authority in this branch of horticulture.

Mr. Campbell was an active member of all the principal horticultural societies of America, including the Ohio State Horticultural Society, of which he was, for many years, secretary. He took an active part in all the great horticultural and industrial expositions, and was commissioner for the state of Ohio to the French exposition at Paris in 1878.

Campbell, Samuel. By *H. H. Wing.*

Samuel Campbell, live-stock breeder and legislator, was born at Tarbolton, Ayrshire, Scotland, February 14, 1809. He died at New York Mills, near Utica, N. Y., September 22, 1885. He emigrated to America in 1831, and soon became connected with the manufacturing firm of Walcott & Campbell, engaged in the manufacture of cotton cloth at New York Mills, N. Y. He early became interested in agricultural matters. He first bred

Ayrshire cattle, but as early as 1860 began to breed Shorthorns. In 1869, he made an importation of Booth cattle from England, and in the same year purchased from Mr. James O. Sheldon, of Geneva, half of his herd, which was made up largely of Duchess and other Bates'-bred families, which Mr. Sheldon had secured from Mr. Jonathan Thorne. In 1870, Mr. Campbell purchased the remainder of the Sheldon herd, and bred them together carefully for several years, until he determined to close out the whole herd at auction, in 1873. At this time, the fame of the cattle originally bred by Thomas Bates, and especially those known as the Duchess family, had very largely increased, and the Campbell herd contained more of the breeding females of this line than were to be found in any other herd. The announcement of the sale drew buyers from England and all parts of the United States, and the competition was so great for the choicest animals that one cow, the 8th Duchess of Geneva, was sold for $40,600, and several others at prices ranging from $20,000 to $35,000. Mr. Campbell was active in other agricultural matters than the maintenance of his herd. He was president of the New York State Agricultural Society in 1869–70, and a member of the New York State Senate from 1865 to 1869.

Capron, Horace.

Horace Capron, soldier, commissioner of agriculture, was a native of New York, but in boyhood removed to Maryland, where he undertook extensive farming operations. In 1847, his receipts amounted to more than $36,000. In 1854, he removed to Illinois, where he paid special attention to the breeding of Devon cattle. When the war broke out, he enlisted, and rose to the rank of brigadier-general. After the war, he returned to farming. On November 29, 1867, he was appointed Commissioner of Agriculture for the United States, to succeed Commissioner Newton, deceased. He took charge December 4, 1867. He established a system of exchanges of seeds and plants with many of the governments of Europe, Asia and South America. He made a large collection of native grasses, forage and fiber plants. The main building of the Department was completed and occupied during his term. He recommended the establishment of a division of veterinary surgery. The Division of Botany was organized in 1868. He resigned the Commissionership on June 27, 1871, to accept an invitation from the Japanese government to take charge of certain agricultural experiments and improvements in Japan, where he remained four years. He died February 23, 1885. [Adapted in part from Bulletin No. 3, Division of Publications, United States Department of Agriculture.]

Cary, Freeman Grant. See pages 374, 375.

Chapman, Albert.

Albert Chapman, sheep-breeder, was born April 18, 1823, at Neybridge, Vt. He died October 22, 1893. He was educated at the common schools. He lived on his father's farm until 1851, when he was married to Matilda Grace Mulchahey, of Warren, R. I. His father raised Saxony sheep, and the lad had charge of them. He drove a large flock of sheep from Vermont to Kentucky. After his marriage, he removed to Forestdale, Vt., Sudbury, Vt., and Pikesville, Md. He removed from here to Washington, during the war, and then went to Troy, N. Y. Later, he returned to Vermont, and was made a member of the State Board of Agriculture. He was founder of the Vermont Merino Sheep Breeders' Association, in 1876, and served as its secretary from its organization until his death. He was also secretary of the National Wool Growers' Association, and president of the Sheep Register Association. He was a contributor to the National Live Stock Journal. He had charge of the sheep and wool exhibit from Vermont at the Columbian Exposition, Chicago.

Chapman, John. By *J. O. Cunningham.*

John Chapman, better known as Johnny Appleseed, itinerant nurseryman, son of Nathaniel Chapman, senior, was born near Springfield, Mass., in 1775. He died in St. Joseph township, Allen county, Indiana, on March 11, 1847. From early in the nineteenth century until about 1838 he lived mostly in northern Ohio. Before going to Ohio, he spent some time in western Pennsylvania, engaged in the nursery business, and there seems to have conceived the career of a nurseryman to the future pioneers of the Ohio country. He was first noted on the Ohio river, in the year 1806, with two canoes lashed together, laden with bags of appleseeds collected from the cider presses of western Pennsylvania, bound for the new lands in Ohio. His first nursery was on the Ohio river, opposite Wellsburg, Va., but his chief operations were in the counties of Licking, Knox, Richland, Wayne, Ashland and Huron, although the valleys of the Muskingum river and its affluents contained many nurseries. He extended his operations to the Maumee country, and finally to Indiana. He went from place to place on the wild frontier, clearing here and there patches of land for new nurseries. When the settlers had made their appearance and were ready for orchard-planting, he was ready with the young trees, which he either gave them without charge or bartered to them for an old coat or for any other article he could use. Many of the early orchards in Ohio originated thus. From his vocation he became generally known as Appleseed John, which denomination was later changed to Johnny Appleseed.

Chapman was intensely religious and benevolent, professing the faith of Swedenborg. To his pioneer friends he zealously extolled his faith, and always carried with him books and literature supporting the same for distribution, tearing a volume into two or more parts sometimes, so as to give to each a part, when he had not enough for all. His love for all of God's creatures excluded none, not even the wild beasts, mosquitos and rattle-snakes of his forest home. He was a vegetarian, and was strongly opposed to taking life even for food. His mission was one of peace and good will, and he never carried a weapon. He never married and had no home, passing from one settlement to another, abiding at times in the cabins of the pioneers, with no bed but the cabin floor; oftener in the forests, his shelter being no other than a hollow log. For a time he dwelt with Caleb Palmer, in Greenfield township, Huron county, Ohio, and with his half-sister, Mrs. Groom, of Mansfield. During the last war with Great Britain, he was particularly active in preventing violence to the whites from the Indians, extending his efforts as far north as the south shore of Lake Erie. With the Indians of Ohio he was as friendly as with the whites, and they regarded him as a "medicine man."

Chapman is sometimes spoken of as an ignorant man; but, comparing his intelligence with that of the people of that day and country, this can hardly be supported. He was a reader and a thinker of more than ordinary capacity, and at a Fourth of July celebration held in Norwalk, Ohio, in 1816, he was the orator of the day. It is also said of him that he was fairly well educated, "well-read, and was polite and attentive in manner and chaste in conversation." So highly is his memory revered among the descendants of those with whom he associated, that a granite monument to his memory was erected in one of the public parks of Mansfield and unveiled on November 8, 1900. His name was also inscribed on a monument erected to commemorate a historical event in Ashland county, which was unveiled on September 15, 1882. [See Cyclopedia of American Horticulture, page 78.]

Clark, William Smith. (Fig. 124.)

By *Atherton Clark.*

William Smith Clark, teacher, soldier, legislator, administrator, was born in Ashfield, Mass., July 31, 1826. He died at Amherst, Mass., March 9, 1886. He was graduated from Amherst College in 1848. After two years of study in Germany, he received the degree of Ph.D. from the University in Göttingen, and on his return to this country in 1852 was elected to the chair of Chemistry, Botany and Zoölogy in Amherst College. In 1867, he resigned this position to undertake, as President of the Massachusetts Agricultural College, the organization and development of that new institution, and to this work he devoted himself until his resignation in 1879. The last few years of his life he spent quietly in Amherst, incapacitated by disease of the heart for any further work.

Mr. Clark's life was one of great activity. At the outbreak of the Civil war in 1861, he volunteered and was commissioned Major in the Twenty-First Massachusetts Volunteers. Promotion to Lieutenant-Colonel and Colonel followed, and in September, 1862, he was recommended by General Burnside for promotion as Brigadier General. In 1864, he was a presidential elector and secretary of the electoral college. In 1864, 1865, and 1867, he was a representative in the legislature, receiving, on one occasion, a nearly unanimous election. He was trustee of several academic institutions and prominent in local enterprises.

President Clark received from Amherst College, in 1874, the degree of LL.D. He was a Fellow of the American Academy of Arts and Sciences, a member at large of the Massachusetts State Board of Agriculture from 1859 to 1861, and member ex-officio from 1867 to 1879, a member of the Massachusetts Horticultural and New England Agricultural Societies, and honorary member of the Massachusetts Society for Promoting Agriculture. He contributed numerous articles to the Annual Reports of the Massachusetts State Board of Agriculture, the most important being those of 1873 and 1874 on "The Circulation of Sap in Plants," and "Observations on the Phenomena of Plant Life." The novel experiments conducted during the investigations reported in these papers attracted wide attention, particularly the squash in its iron harness, used in testing the expansive force exerted by the growing cell, which lifted five thousand pounds before it ceased to grow.

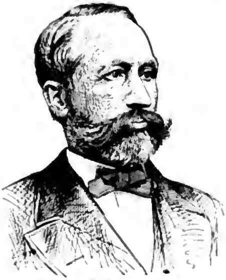


Fig. 124. William Smith Clark.

In 1876, the Japanese government invited President Clark to go to Japan and organize the Imperial College of Agriculture at Sapporo. He accepted, and for some months presided over the interests of both colleges. His success in Sapporo was as marked as at Amherst, and the institution he organized has become one of the important educational centers of the Japanese empire.

In the life and work of President Clark, his services to agricultural education are preëminent. He early appreciated the need for such education, and advocated the establishment of agricultural experiment stations. He was a careful student of the natural sciences, a born leader, enthusiastic and magnetic.

Clarkson, Coker F. By *Henry Wallace.*

Coker F. Clarkson, farmer and editor, known as Father Clarkson, was born at Dixmont, a suburb of Bangor, Maine, in the year 1811. He died in May, 1890. In 1822, the family moved to Brookville, Indiana. When he was seventeen years of age, he went to Lawrenceburg, Indiana, and learned the trade of printer. In 1830, he returned to Brookville, founded and was for twenty-four years the editor of the Indiana American, a weekly paper in which agriculture had a large place. At the same time, he owned and personally managed a farm. In 1854, he bought and occupied a section of land in Grundy county, Iowa, then on the extreme frontier. In 1869, he moved to Des Moines and, with his two sons, purchased the Iowa State Register, the leading daily and weekly paper of the state. He founded, and edited until his death, an agricultural department in the paper.

Mr. Clarkson was tendered the office of commissioner of agriculture by both President Hayes and President Grant, but declined. While on his Grundy county farm, he was elected state senator, in which position he was instrumental in securing the establishment of the Iowa State Agricultural College, at Ames. He also secured the passage of a bill raising to lessees the appraisement of the land grant, thus preventing the looting of the land grant of the college by speculators. His great service to agriculture was his establishment and conduct of the Weekly Register, the weekly edition of the Iowa State Register. The distinctive feature of this was its agricultural department.

While intense in his convictions and often intolerant, he had a broad and tender human sympathy with all toilers. He was an ardent Whig. He stood for agricultural advancement and improvement in the breeds of live-stock. He flailed out to the finish agricultural heresies and ridiculed agricultural superstitions. He lent aid to the agricultural societies, and took an active part in the various improved stock-breeders' and dairy associations. He was instrumental in the formation of a farmers' protective association to manufacture wire for fencing and to fight the combination then selling wire at exorbitant prices. After years of litigation the combination was broken.

Clute, Oscar. By *A. J. Cook.*

Dr. Oscar Clute, educator, was born in Albany, N. Y., March 11, 1837. He died in the Soldiers' Home, near Los Angeles, Cal., January 27, 1902. Until seventeen years of age, he was on the farm or in school, and always strenuously active in mind and body. At seventeen, he was elected principal of the Binghamton schools, which position he held for two years, when he entered the Susquehanna Academy for one year. He was then elected principal of the Ionia (Michigan) schools, from which position he resigned the next year to enter the Sophomore class of the Michigan Agricultural College. He was graduated from this college in 1862. During his senior year in college he taught classes in the preparatory department, and on graduation was engaged as instructor. The next year, he was elected to a professorship. He served the college for four years, when he resigned to take a course in theology at Meadville, Pa. On graduation from the Theological Academy, he accepted a call from the First Unitarian Church at Vineland, New Jersey, where he remained for six years. He ministered in the same capacity at Newark, New Jersey, two years; at Keokuk, Iowa, four years; at Iowa City, Iowa, seven years; and at Pomona, California, one year. From this last church he was called to the presidency of the Michigan Agricultural College, which position he held for four years. In 1889, he resigned to assume the same duties at the Agricultural College of Florida, where he remained for four years. His health at this time became greatly impaired, and he returned to his old church in California. However, he was forced to resign his pastorship because of ill-health, after a few months of service. He remained in Pomona, California, until 1891, when he entered the Soldiers' Home, where he died. In 1868, he married Miss Mary Merrilees, by whom he had six children.

As a student in college, Dr. Clute was very thorough and untiring in his effort to reach the first place. As a teacher, he won the respect of his pupils and aroused an enthusiasm that secured the best work. While at Vineland, he was president of the Pomological Club, which gained, largely through his influence, more than a national reputation. While at Iowa City, he worked very successfully with bees, for rest and recreation. At this time he wrote a very fascinating book, Blessed Bees, which, though fiction, was replete with information. As a preacher, Dr. Clute was reverent, earnest and eloquent, always a hard student, not only of history and literature, but of nature as well.

Cobbett, William.

William Cobbett (1762–1835), the once famous English author, had two periods of residence in America. His horticultural writings of chief interest are Cottage Economy, A Year's Residence in the United States of America, and the American Gardener (1821), which was reproduced with modifications as The English Gardener, in 1827. [See his biography in Cyclopedia of American Horticulture, page 338.]

Collier, Peter. (Fig. 125.) By *W. H. Jordan.*

Peter Collier, teacher, chemist, executive, was born in Chittenango, New York, August 17, 1835. He died at Ann Arbor, Michigan, June 29, 1896, and was buried at Providence, R. I. His parents were Jacob and Mary Elizabeth Collier. Between the ages of fourteen and nineteen years, his time was spent in a store, after which he fitted for Yale College and was graduated from that institution in 1861. Following his graduation, he turned his attention to scientific studies in the Sheffield Scientific School, devoting himself chiefly to chemistry under Prof. Samuel Johnson. He remained in this school, either as student or assistant, until 1866, when the degree of Ph.D. was conferred on him.

In 1867, Dr. Collier was appointed to the position of Professor of Chemistry and Mineralogy in Vermont University, also Professor of Chemistry and Toxicology in the medical department of the University, which positions he held until 1877.

During this period of service, he declined a professorship in Williams College, received the degree of M.D. from the University, and became dean of the medical faculty; was elected, in 1871, Secretary of the Vermont State Board of Agriculture, Mining and Manufactures; conducted a series of farmers' institutes throughout the state, perhaps the first in this country, and in 1873 visited the International Exposition at Vienna, as a member of the United States Scientific Commission appointed by President Grant.

Fig. 125. Peter Collier.

While in Vermont, despite his numerous duties, Dr. Collier interested himself in agricultural affairs, especially on the chemical side, and he should be counted among the earlier men who aided in promoting the movement in agricultural education and research that has now reached such large proportions.

In 1877, Dr. Collier accepted the responsible position of Chief Chemist to the United States Department of Agriculture. The chief problem that he attacked was the value of sorghum as a sugar-producing plant, which he studied in a most thorough and comprehensive manner. In 1883, he resigned as chemist of the Department, and spent the next four years in preparing and publishing his sorghum investigations.

In 1887, Dr. Collier was elected director of the New York Agricultural Experiment Station, succeeding Dr. E. L. Sturtevant. In 1895, his health became seriously impaired, and he relinquished his position as director of the station.

Dr. Collier was the author of many reports or parts of reports while in Vermont, Washington and New York, was a frequent contributor to the press and gave many addresses before agricultural assemblages. His most notable work is a publication of 570 pages, having the title "Sorghum, Its Culture and Manufacture Economically Considered as a Source of Sugar, Syrups and Fodders, with numerous illustrations of plants, machinery and the like."

Colman, Henry. By *F. H. Fowler.*

Rev. Henry Colman, writer, teacher, preacher, was born in Boston, Mass., in 1785, and died suddenly in London, England, in 1849. He was graduated from Dartmouth College in 1805, and was for some years a Unitarian clergyman.

While living in Deerfield, Mass., in 1837, he was appointed by Governor Edward Everett commissioner for an agricultural survey of the state. He received his appointment in May, and almost immediately put himself in touch with some of the leading farmers of the commonwealth with a view of getting their advice and coöperation. Four volumes of his activities as commissioner were published by the state in 1838-41. He visited many of the towns and labored assiduously satisfactorily to perform the task. He attended cattle shows, held meetings among the farmers and, on leave of the executive, traveled several thousands of miles in other states for the purpose of looking at their improvements and gathering information: into Vermont, to see the sheep industry; into Connecticut, Rhode Island and New York, to see the improved stock; into New Jersey, to see the application of the marls, and to look at the beet-sugar establishments; into Pennsylvania, to see the application of lime; and into New Jersey, Pennsylvania, Virginia and the District of Columbia, to look at the culture of silk.

In his four reports, he described in detail the agriculture of the counties of Berkshire, Essex, Franklin and Middlesex, including, also, in his third report, valuable information on the culture of wheat and silk.

One feature of this survey is worthy of note. Mr. Colman instituted and provided for a series of weekly meetings of the farmers of the legislature, and others interested in agricultural improvement, which were held during three successive sessions of the legislature, which meetings he punctually attended, and of which he furnished full reports for the public papers.

In 1843, Mr. Colman visited agricultural Europe and gathered much valuable material, which was later published in two volumes under the title of European Agriculture and Rural Economy (Boston, 1846-48).

He was a member of several agricultural organizations in America, and an honorary member of the Royal Agricultural Society of England. Mr. Colman was widely known as a writer on agricultural matters, and was an eminent friend of the farmer. A contemporary said of him that his labors in the cause of agriculture could hardly be estimated too highly. It has also been said that he was an apostle of agricultural education, and with untiring zeal urged its extension. In 1849, the Essex Agricultural Society purchased Mr. Colman's valuable agricultural library to aid in establishing a library for the use of its members.

Cook, George Hammell. By *Byron D. Halsted.*

George Hammell Cook, agricultural geologist, was born at Hanover, N. J., January 5, 1818. He died September 22, 1889. He was graduated from the Rensselaer Polytechnic Institute in 1839, as civil engineer, and became instructor in the same institution from 1842–46, when he received the further degrees of B.S. and M.S. After teaching for a time in the Albany Academy, Professor Cook was elected, in 1853, to the chair of Chemistry and Natural Sciences at Rutgers College. The title of the chair was changed to Chemistry, Geology and Agriculture in 1878, and to Geology and Agriculture in 1880. Dr. Cook became associated with the New Jersey Geological Survey in 1854, and ten years later was made State Geologist, a position he held until his death. His high rank as a scientific man is based in large part on the superior work done in this connection. He blended pure science with practical needs, as shown in the reclaiming of waste land, developing fertilizer deposits, and improving the water-supplies throughout the state.

Dr. Cook was one of the earliest members of the Society for the Promotion of Agricultural Science, his contributions being usually on some phases of the relation of soils to crop-growing. He strove to develop agriculture along broad, deep lines of research, and was the chief promoter of the State Experiment Station. His administrative energies were further rewarded in the passing of the Hatch Act, after which the last years of his life were largely filled with the building up of the two experiment stations, over which he held the directorship, with characteristic enthusiasm and success. In 1873, he was foremost in the formation of the State Board of Agriculture, of which he was the chairman of the executive committee for sixteen years. At the same time, he was a member of the American Philosophical Society, American Association for the Advancement of Science (vice-president), American Institute of Mining Engineers, the National Academy of Sciences, and similar learned societies abroad.

Coxe, William.

William Coxe, pioneer pomologist, was born in Philadelphia, May 3, 1762. He died on his farm on the Delaware river, near Burlington, February 25, 1831. He deserves special remembrance for his book, A View of the Cultivation of Fruit Trees, and the Management of Orchards and Cider (1817). [See notes in Cyclopedia of American Horticulture, page 389.]

Deane, Samuel.

Rev. Samuel Deane, poet, minister of the gospel, agricultural writer, was born in Dedham, Mass., July 30, 1733. He died at Falmouth (now Portland), Me., November 12, 1814. In 1790, he published New England Farmer, or Georgical Dictionary, the first American encyclopedic work on agriculture. [See notes in Cyclopedia of American Horticulture, page 462.]

Dearborn, Henry Alexander Schammell.

Henry Alexander Schammell Dearborn (1783–1851). soldier, statesmen, author, was also an ardent horticulturist. He was first president of the Massachusetts Horticultural Society. He was instrumental in the establishment of the Mt. Auburn Cemetery. He translated Abbe Berlese's Monography of the Camellia, published in Boston in 1838. He translated from the French, in 1830, an account of the since-famous *Morus multicaulis.* [See notes in Cyclopedia of American Horticulture, page 462.]

De Crevecœur, J. Hector Saint John. (Fig. 126.)

(Michel Guillaume) J. Hector Saint John de Crevecœur, soldier, explorer, naturalist, author, statesman, was born January 31, 1735, at Caen in Normandy, France. He died November 12, 1813, at Sarcelles, France. He was educated at Caen and in England. In 1754, he came to America. He passed many years in Canada, taking part in the stirring events of the time. He planned a map of the country from the mountains of Virginia to the township of Three Rivers on the St. Lawrence. In 1758, he was appointed lieutenant in the second battalion of the regiment of the Sarre, and served with credit in the campaigns of 1758 and 1759. He did not return to France at the close of the war, but came to the territory of the colony of New York. He obtained employment as a surveyor, but wearying of this, he chose to try his fortune in Pennsylvania, where he began his harvest of crops, seventeen times repeated, from the soil of America. At the suggestion of Ethan Allen, De Crevecœur concurring, the town of St. Johnsbury, Vermont, was named from him.

Fig. 126. J. Hector Saint John De Crevecœur.

In 1764, De Crevecœur became a naturalized citizen of the colony of New York and located on a plantation in Cornwall, Orange county, which he called Pine Hill, and which he farmed until 1779. On September 20, 1769, he married Miss Mehitable Tippet, of Westchester, N. Y.

In 1779, after an absence from France of twenty-five years, during which he had traveled extensively in America, he sailed for the continent. In 1781, he was in London, where he made the sale of the manuscript of his "Letters from an American Farmer," for thirty guineas. This was first published in London in 1782, translated and published in Paris in 1784. A second and enlarged edition was published in France in 1787. On reaching France, De Crevecoeur interested himself in the affairs of the Normandy farmers, and published a booklet on the cultivation of the potato. This bears the date of January 1, 1782, at Caen, and was signed "Normano Americanus."

On June 22, 1783, he secured a commission as consul at New York, and arrived in that city November 19, shortly after its evacuation by the British. Here he learned that the farm-house in Cornwall had been burned, that his wife was dead, and that his children had disappeared. He succeeded in finding the children. In 1790, he returned to France never to return to America. At the beginning of the year 1801, he published at Paris "Voyage dans la haute Pennsylvanie et dans l'État de New York." The book contained much information not easily accessible elsewhere at that time.

Deere, John.

John Deere, inventor of the steel plow, was born at Rutland, Vt., February 7, 1804. He died at Moline, Ill., May 17, 1886. He was the third son of William Rinold and Sarah (Yates) Deere. His father was a native of England and his mother of Connecticut. The boy attended the common schools of Vermont. At the age of seventeen years, he apprenticed himself to Captain Benjamin Lawrence, of Middlebury, to learn the blacksmith's trade, which he mastered in four years. After a year or two he removed to Burlington, Vt., where he hammered out by hand the iron work for a saw- and oil-mill, erected at the neighboring town of Colchester. He practiced his trade at various places, but profits were small and he accumulated slowly. In 1837, he determined to go west, and settled at the village of Grand Detour, Ogle county, Ill. Here he established himself in the blacksmith business, and found a very ready demand for his services. He was an excellent mechanic, and soon added the building of plows to his general work. He saw that the iron plow with wooden moldboard was ill-adapted to the prairie soil. This observation resulted in a series of experiments and improvements, out of which was finally evolved the present steel plow. In 1838 he made three plows with iron landside and standard, steel share and moldboard. In 1839, ten plows were built and the entire iron works of a new saw- and flouring-mill made. In 1840, forty plows were made, and in 1841, seventy-five steel moldboard plows. In 1843, he took Major Andrus into partnership, and enlarged his business. In 1846, the annual product had increased to 1,000 plows. His ingenuity manifested itself particularly in the shaping of the moldboard. In 1847, he removed to Moline, Ill., where the business has been conducted since. Here the enterprise rapidly grew, and in 1857, 10,000 plows were made. In 1858 he took his son, Charles H., and Stephen H. Velie, one of his sons-in-law, into the business as partners, and the name was changed to Deere & Company. In 1868, the company was incorporated, with John Deere as president, a position which he held until his death.

Mr. Deere was twice married: in 1827, at Granville, Vt., to Miss Damaris Lamb, who died at Moline, on February 17, 1865, leaving eight children. His second marriage occurred in 1867, to a younger sister of his first wife. Mr. Deere was elected mayor of the city of Moline and served two years. He was also president of the First National Bank of Moline. He was a large contributor toward the founding of the public library, and was one of its directors. He was a man of great power and decision of character, sympathetic and generous.

Delafield, John. See page 392.

Delano, Columbus. By *C. E. Thorne.*

Columbus Delano, lawyer, farmer, statesman, was born at Shoreham, Vt., June 15, 1809, and died at his residence, Lake Home, near Mt. Vernon, Knox county, Ohio, October 23, 1896. When eight years old, he was removed to Ohio with his family, and his boyhood was spent on a farm. He secured such education as the common schools of that time could furnish, with a fair knowledge of the classics. In 1832, he was admitted to the Knox county bar, and entered on the practice of law in Mt. Vernon. He was an anti-slavery Whig in politics, and took an active part in the politics of the day. In 1844, he was elected to Congress from a district strongly democratic. At the end of his term in Congress he removed to New York city and entered the banking business in the firm of Delano, Dunlevy & Co. In 1856, he returned to Ohio to engage in agriculture, for which he had always a strong liking. He was a delegate to the Chicago Republican Convention, and was an ardent supporter of Mr. Lincoln. In 1861, he was appointed by Governor Dennison Commissary-General of Ohio. In 1863, he was a member of the Ohio legislature. In 1864, he was chairman of the Ohio delegation at the Baltimore convention. He was a member of the thirty-ninth and fortieth congresses, and in 1869 was appointed Commissioner of Internal Revenue by President Grant. In 1870, he was appointed Secretary of the Interior, which position he held until 1875, when he returned to Ohio and engaged in the active management of his large estate and in sheep-raising. He was the promotor, and for many years the president, of the National Wool Growers' Association. Mr. Delano was for many years a trustee of Kenyon College, being chairman of the executive committee of its board of trustees at the time of his death. "Delano Hall," of that college, was built by him. He was senior warden of the Protestant Episcopal church at Mt. Vernon, and was repeatedly sent as delegate to the national assemblies of that church. In 1834, he was married to Miss Elizabeth Bateman Leavenworth, a native of Connecticut, who survived him.

During the forty years, 1850 to 1890, Ohio led all the states of the Union in the number of sheep kept. During this period, however, Australia had become one of the greatest wool-producing countries on the globe, and Australian wools came into direct competition with those from Ohio. In consequence of this competition, the Ohio wool-grower became the most earnest of advocates of the protective tariff system, and Mr. Delano, himself a wool-grower on a large scale, naturally joined in the championship of this system, a championship of which his prominent position in political and governmental affairs made him the recognized leader. To him, probably more than to any other man, therefore, has been due the maintenance of a high tariff on wool.

Dickson, David. (Fig. 127.) By *G. F. Hunnicutt.*

David Dickson, farmer, was born July 6, 1809, and died in Hancock county, Ga., February 18, 1885. At the age of twenty-one, he started in the mercantile business with the small capital of $1,200. By close attention to his business, after fourteen years he closed out with $25,000. With this he decided to devote himself to farming. He bought 266 acres of land in Hancock county, and stocked it well. By judicious practice he increased the productivity of the land manyfold. Seeing that the system of cultivation of crops was radically wrong, he began to break his land deep, to cultivate shallow, and to apply commercial fertilizer or Peruvian guano. He formulated the following compound, known as Dickson's formula: Peruvian guano, 100 pounds; dissolved bone, 100 pounds; common salt, 100 pounds; land-plaster, 50 pounds. David Dickson continued to use this formula as long as he lived. He invented the Dickson Sweep, a plow admirably adapted to sandy soil, and one that lessened the number of furrows in cultivating a crop. He practiced "seed selection," and developed the first prolific variety of cotton, known as "Dickson's Cluster." He published in The Southern Cultivator a series of articles which were combined into a pamphlet and published in two editions, as "David Dickson's System of Farming." These articles have been widely read and have been effective in improving methods of farming.

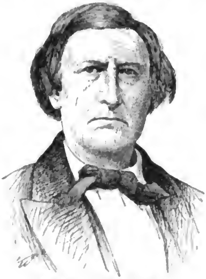


Fig. 127. David Dickson.

David Dickson was the first millionaire farmer in the South. He lost five years' work during the war, growing only food for the Confederate soldiers. The Federal soldiers burned over $300,000 worth of cotton and other property belonging to him. It was characteristic of him to work with his laborers until he had shown them how to work quickly and to advantage. He won the distinction of being one of the South's greatest farmers, and left an indelible impression on the agriculture of Georgia.

Downing, Andrew Jackson.

Andrew Jackson Downing, the first great landscape-gardener of America, was born at Newburg, N. Y., October 30, 1815. He perished by drowning, July 28, 1852. In 1841, he published his Treatise on the Theory and Practice of Landscape Gardening, and Cottage Residences. In 1845, appeared his Fruits and Fruit Trees of America; in 1846, he founded, at Albany, New York, The Horticulturist. [See his biography and picture in Cyclopedia of American Horticulture, page 501 and Plate II.]

Downing, Charles.

Charles Downing, pomologist, was born at Newburg, N. Y., July 9, 1802. He died January 18, 1885. He continued and revised Fruits and Fruit Trees of America, first issued by his brother Andrew. [See his biography and picture in Cyclopedia of American Horticulture, page 502 and Plate II.]

Dreer, Henry A.

Henry A. Dreer, seedsman, was born in Philadelphia, August 24, 1818. He died there, December 22, 1873. He founded one of the oldest American horticultural establishments, now conducted by his son, William F., in Philadelphia. He compiled several small works in connection with his business. [For biographical sketch, see Cyclopedia of American Horticulture, page 507.]

Drummond, John Hamilton.
By *Frederic T. Bioletti.*

Captain John Hamilton Drummond, merchant and farmer, was born about 1850. He died in 1890. He was the second son of David Drummond, a well-known banker and merchant and philanthropist, of Dublin, Ireland. He was educated at Trinity College, Dublin. He served in the Thirty-Fourth regiment of the regular English army in England and India until 1877, when he came to California and became a sheep-raiser in Sonoma, county, near Cloverdale. Soon after, he purchased the Dunfillan Ranch, near Glen Ellen, Sonoma county, and was very active in importing new varieties of wine grapes from France, and of table grapes from English hothouses. He was one of the first to graft over the old Mission vineyards with fine varieties. He did much to improve the quality of California wines.

Dufour, John James.

John James Dufour, Swiss vigneron, was the author of Vine Dresser's Guide (1826). He died at Vevay, Indiana, in 1827. [See notes in Cyclopedia of American Horticulture, page 509.]

Eaton, Benjamin Harrison. By *R. P. Teele.*

Benjamin Harrison Eaton, farmer and governor of Colorado, was born in Coshocton county, Ohio, December 15, 1833. He died at Greeley, Col., October 29, 1904. He was the son of Levi Eaton and Hannah Eaton. He was educated at the West Bedford Academy, in Coshocton county, graduated in 1852, and taught school in Ohio from 1852 to 1854. He removed to Louisa county, Iowa, in 1854, and engaged in farming until 1859. He married, in 1856, Deliah Wolf, of Iowa, who died in 1857; he married again, in 1864, Rebecca J. Hill, of Iowa. In 1859, he went to Colorado, and, after mining there two years, removed to New Mexico, where he engaged in mining until 1864, when he returned to Colorado. He located in the Cache la Poudre valley, about half way between the present cities of Fort Collins and Greeley, and became one of the leaders and pioneers in farming in that section, on an extensive scale, by means of irrigation. He later moved to Greeley, where he resided until his death. He became prominent in the Republican party of Colorado; was a member of both the House and Senate in the territorial legislature, and in 1884 was elected governor of Colorado, serving for two years.

Although Governor Eaton served his state with distinction in several public capacities, his greatest service, and one on which his fame rests, was to the agriculture of the state. When the dome of the state capitol building was nearing completion, it was decided to place in it the portraits of the men who had given the most effective service to the state in the various lines of development. Governor Eaton was chosen for a place as the man who had done the most to bring about a high development of the state's agriculture. In that development he was ever a pioneer. When Colorado was known only as a mining camp, he began agriculture by raising hay on the river bottom lands, and selling it in the mining camps. When the river bottoms were taken up, he was the first to build ditches to carry water to the higher bench lands and branch out to other crops than hay. When the Union Colony, fathered by Horace Greeley, was located at Greeley, Governor Eaton built its ditches, and passed on from that to still larger ditches, some of which are still among the largest in the state. He became the great ditch-builder of Colorado.

The settlement of the Cache la Poudre valley and the extension of irrigation soon reached the limit of the normal flow of the stream. Under this condition, agriculture was limited, except on a small area, to crops which could be matured in the early summer during the high-water period. The conditions demanded a higher type of agriculture, which was possible only with a longer irrigating season, and this required the storing of the flood waters of spring for use in the late summer. Here, again, Governor Eaton was a pioneer, building the first reservoirs of any size in the state. This example has been followed by others, until the Cache la Poudre river is probably more completely utilized than any other stream in the United States, while its valley represents the highest agricultural development in this country. This development is very largely the creation of Governor Eaton.

Eliot, Jared. (Figs. 128, 129.)

Jared Eliot, minister of the gospel, author of the first American book on agriculture, was born November 7, 1685, and died April 22, 1763. He was a grandson of John Eliot, the "apostle to the Indians." He was graduated from Yale College in 1706. He taught school for a time. From October 26, 1709, until his death, he was pastor at Killingworth, Conn., where he became noted as author, physician, botanist, investigator and philosopher. He was elected a member of the Royal Society, of London. He introduced the mulberry tree into Connecticut and wrote an essay on the silkworm. He discovered a process of extracting iron from ferrugineous sands. His "Essays Upon Field Husbandry" formed the first American book devoted exclusively to agriculture. There were six essays, at first issued separately in New London, New Haven and New York, appearing in 1747, 1749, 1751, 1753, 1754 and 1759. An enlarged edition was printed in Boston in 1760, and another a little later, in New York. It is now very rare. Mr. Eliot was a high-minded, progressive and useful citizen. Many of his sermons were separately reprinted.

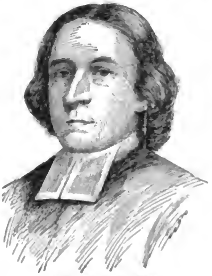


Fig. 128. Jared Eliot.

Ellis, Seth Hockett. By *Dora Ellis.*

Seth Hockett Ellis, farmer, statesman, the father of the Ohio State Grange, was born on a farm in Clinton county, Ohio, January 3, 1830, and died at his home in Waynesville, Ohio, June 23, 1904. He attended the near-by district school, and later the

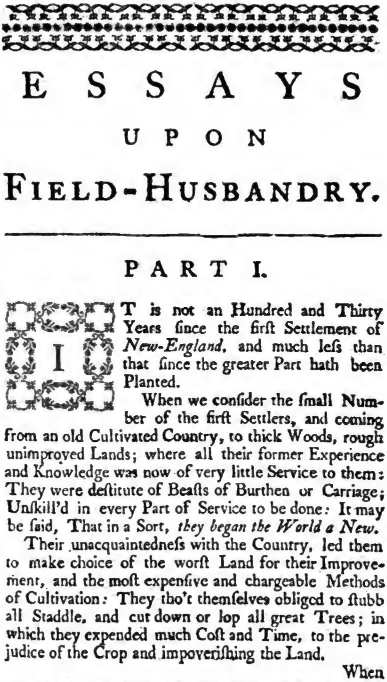
Springboro (Ohio) village school. At twenty-one he was married, and soon after settled on a farm near Springboro, where he spent the greater part of his life. He was always an active worker in the church and Sunday-school. He was a leader in the prohibition movement in the state and nation, and in 1895, was the Prohibition candidate for governor of Ohio. He devoted much time and energy to political and economic reform, working, especially, for the referendum and a more just system of state taxation. In 1900, he was the candidate of the Unicn Reform party for president of the United States.

The great work of Mr. Ellis' life was accomplished through his connection with the Grange, both state and national. When the Ohio State Grange was organized in 1873, he was elected its first master, and he held this position for eighteen years, altogether. He served, also, as chaplain, and on the Executive Committee of the National Grange.

Mr. Ellis was a man of the utmost sincerity and steadfastness, yet always tactful; one whose character and motives were absolutely free from guile; who took the kindliest interest in the welfare of all those with whom he came in contact, and who had a most remarkable memory for names, faces, and the personal interests of others.

Mr. Ellis was appointed a member of the Board of Trustees of the State University — originally the "Ohio Agricultural and Mechanical College" — just after the change of name, and for eight years, through many discouraging experiences, he worked steadfastly for the interests of agricultural education in the institution. It was very largely through his influence, within the governing board and throughout the state at large, that the way was prepared for the present magnificent college of agriculture of the University.

His transfer to the Board of Control of the Experiment Station, at the time of its reorganization under the Hatch Act, was of his own choosing, and, during his long service on that Board, his thoroughly practical knowledge of farm conditions in Ohio and his wide acquaintance with the leading farmers of the state, and with others interested in the state's prosperity, enabled him to be of the greatest service in establishing the station's work on a broad and enduring foundation. It is within bounds to say that no other man has contributed so much to the advancement of agriculture in Ohio, along social and intellectual lines, as has Mr. Ellis.



ESSAYS

UPON

FIELD-HUSBANDRY.

PART I.

IT is not an Hundred and Thirty Years ſince the firſt Settlement of *New-England*, and much leſs than that ſince the greater Part hath been Planted.

When we conſider the ſmall Number of the firſt Settlers, and coming from an old Cultivated Country, to thick Woods, rough unimproved Lands; where all their former Experience and Knowledge was now of very little Service to them: They were deſtitute of Beaſts of Burthen or Carriage; Unſkill'd in every Part of Service to be done: It may be ſaid, That in a Sort, *they began the World a New.*

Their unacquaintedneſs with the Country, led them to make choice of the worſt Land for their Improvement, and the moſt expenſive and chargeable Methods of Cultivation: They tho't themſelves obliged to ſtubb all Staddle, and cut down or lop all great Trees; in which they expended much Coſt and Time, to the prejudice of the Crop and impoveriſhing the Land.

When

Fig. 129. Facsimile page of Jared Eliot's "Essays upon Field-Husbandry."

Ellsworth, Henry Leavitt. (Fig. 130.)
By *W. H. Beal.*

Henry Leavitt Ellsworth, founder of the United States Department of Agriculture, was a son of Oliver Ellsworth, second Chief Justice of the United States. He was born at Windsor, Conn., November 10, 1791, and died at Fairhaven, Conn., December 27, 1858. He was graduated from Yale college in 1810, studied law, and practiced his profession for several years at Hartford, Conn. He was appointed by President Jackson, resident commissioner among certain of the Indian tribes of southwestern United States, and became United States Commissioner of Patents in July, 1836, holding this position until May, 1845. He then took up his residence at Lafayette, Ind., where he engaged in the purchase and settlement of government lands, but returned to Connecticut shortly before his death.

Fig. 130. Henry Leavitt Ellsworth.

Soon after assuming the office of Commissioner of Patents, Mr. Ellsworth received from Naval and United States consular officers and others abroad certain seeds and plants which he distributed to progressive farmers throughout the country. This was done without government authority or aid, save the use of franks of congressmen who were his personal friends. Thus, from the beginning of his service as Commissioner of Patents, he directed his attention to the improvement of the agriculture of the country by such means as were at his command. His previous wide experience and observation in different parts of the country had doubtless impressed his mind with the importance of such work, but his interest in the subject seems to have been stimulated more especially by inventions of improved labor-saving agricultural implements which came to his attention as Commissioner of Patents.

In his first annual report, and in later reports, Mr. Ellsworth urged with great force on Congress the importance of governmental aid to agriculture, and in 1839 he secured from that body the first small appropriation of $1,000 (to be taken from the accumulated funds of the Patent office) for collecting and distributing new and valuable seeds and plants, prosecuting agricultural investigation and collecting agricultural statistics. [See Vol. II, pp. 70, 71.] This marks the foundation of the United States Department of Agriculture, for although the agricultural work continued for many years to be cared for by a small division of the Patent Office, it later grew into the Department of Agriculture, first as a separate bureau (in 1862) and finally as an executive department under the direction of a cabinet officer (in 1889).

In his reports to Congress, Commissioner Ellsworth included agricultural statistics, collected through census officers and correspondents throughout the country, with surveys of crop conditions and prospects, the results of seed and plant distribution and reviews of progress in agricultural science in this country and abroad.

At this period, the Smithsonian collections were housed in the Patent Office, and Mr. Ellsworth was led to suggest that these and other collections at Washington, as well as a part of the Smithson bequest, might be profitably used in providing a a free course of lectures on science applied to agriculture. This plan was never carried into effect, but in a way this and other purposes which Mr. Ellsworth had in mind for promoting agriculture were to be achieved by the great national department of agriculture of which he, unconsciously perhaps, laid the foundations.

Esterly, George. By *E. D. Coe.*

George Esterly, farm-implement maker, was born on an Ulster county farm, New York, October 17, 1809. He died in 1895. He came of English stock, and farther back of German ancestry. He was ambitious and enterprising, and in 1836 pushed out to the territory of Wisconsin. There he purchased 1,120 acres of very choice land in the county of Walworth and proceeded to farming. The difficulty of procuring sufficient help hampered him greatly, and when, in 1843, he saw 300 acres of fine wheat go back into the ground because he could not harvest it, he set out to procure harvesting machinery, if possible. Nothing adequate could be found and so he built shops and set his inventive genius at work. A "header" was soon devised and its action was so satisfactory that he began its manufacture in 1844. In 1855, he began to build his hand-rake reaper, and, two years later, erected well-equipped shops at Whitewater. In 1865, he added a very successful seeder and cultivator to his output, and in 1870 he brought out a self-rake reaper. In 1875, the firm, now Esterly & Son, began the manufacture of a twine-binder, which at once met with a demand. The works at times employed as many as 600 hands. All went well until 1892, when the factory was removed to Minneapolis and the capital increased to $1,250,000. This, coming at the beginning of the great panic of 1893-6, was a disastrous move, and a receivership was followed by an entire closing of the Esterly enterprise.

Mr. Esterly was a man of fine public spirit, and of great influence in his city and state. Especially was he interested in questions of currency and finance, and several pamphlets which he issued attracted wide attention. He was three times married; one son and four daughters were born to him, all of whom survived when, at the age of eighty-six, he was called to his final rest.

Fairchild, George Thompson. (Fig. 131.)
By *David Fairchild.*

George Thompson Fairchild, educator, the youngest of a family of ten children, was born October 6, 1839, in a small frontier town of Brownhelm in northern Ohio. He died at Columbus, Ohio, March 16, 1901. His parents, Grandison Fairchild and Nancy Harris, were Puritans. Owing to delicate health, as a child he received private instruction, and later went to Oberlin College. After finishing the classical course at that institution, he studied theology. On November 25, 1863, he married Charlotte Pearl Halsted, a Hicksite Quaker from western New York, herself a graduate of the college.

In 1865, George Fairchild was called to the chair of English Literature in the Michigan State Agricultural College. This position he held until 1879; and he filled in addition the offices of assistant secretary of the faculty, teacher of Moral Philosophy and French, professor in charge of the students' rhetoricals and professor in charge of the students' curriculum of study; and in 1873 he was acting president of the college. While thus busily engaged, he also built up the college library and organized the existing plan of student government. In 1879, he was called to the presidency of the agricultural college of Kansas, which was then in its very beginning. Eighteen of the best years of his life he devoted to developing this institution, and to making its influence felt through the State Board of Education, the Association of Agricultural Colleges and Experiment Stations of which he was president, and the National Teachers' Association of which he was president of the Section on Industrial Education.

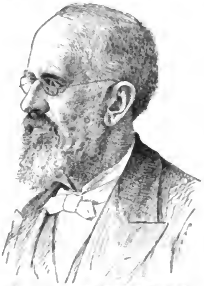


Fig. 131. George Thompson Fairchild.

The part taken by President Fairchild in the framing of the Morrill Act is not generally known. This bill was opposed by the Grange, on the ground that the funds of the agricultural colleges which came from the sale of public lands had hitherto not been used for the teaching of agriculture but for other things in which they are not interested. Dr. Fairchild framed the clause, limiting the use to be made of such funds, which secured the passage of the act.

In 1897, the Populist party for a brief period controlled the Kansas State Legislature, and because, as individuals, the members of the faculty of the college did not agree with the Populistic ideas, the Board of Regents deliberately terminated the official connection of every member of the faculty. President Fairchild resigned, and did everything in his power to prevent this political invasion from injuring the institution to which he had given so many years of his life. Upon his retirement from active work in Kansas, he spent a year in the preparation of his book, Rural Wealth and Welfare. Later, he took up the task of organizing the industrial and agricultural departments of Berea College in Kentucky. It was while vice-president of this institution that he was stricken with the disease which led to an operation in Columbus, Ohio, under which he died.

Fessenden, Thomas Green.

Thomas Green Fessenden (1771–1837), editor and author, founded The New England Farmer, at Boston, in 1822, and edited it until his death. The present New England Farmer is not the lineal successor of Fessenden's paper. Fessenden is chiefly noted as a satirical poet. He also edited the Horticultural Register and The Silk Manual. He wrote The Complete Farmer and Rural Economist, The New American Gardener, and The American Kitchen Gardener. [See biographical sketch in Cyclopedia of American Horticulture, page 581.]

Fitch, Asa. By *L. O. Howard.*

Asa Fitch, entomologist, was born in 1809, at Salem, N. Y., where he died seventy years later. His father was the Hon. Asa Fitch, M.D., a man eminent in the medical profession and in various positions of public trust. The younger Fitch spent his childhood on a farm, going to school at Salem until he was seventeen years of age, when he was sent to the Rensselaer School at Troy, now the Rensselaer Polytechnic Institute. Here he became deeply interested in natural history, and entomology soon became his passion. He graduated in 1827, and began a course of medical studies at the Vermont Academy of Medicine, graduating in 1829, and afterward attending medical lectures at the Rutgers Medical College in New York City. All through his medical course he gave much of his time to the study of insects, and while in New York made industrious use of the libraries, copying descriptions and other matter into manuscript volumes. After completing his medical studies he accompanied the Rensselaer School Expedition to Lake Erie, and afterward left the party and traveled extensively in the western states for the purpose of collecting insects. After returning he married, and practiced medicine for a while at Stillwater, N. Y., giving up his practice in 1838 and returning to Salem to devote his time to the management of his father's business. In this business he devoted himself largely to agricultural pursuits, which gave excellent opportunities for the continuation of his investigations in entomology. He soon began to publish articles on entomology in different periodicals. In 1854, at the instance of the State Agricultural Society, a bill passed the state legislature providing for the investigation of the injurious insects of the state of New York, and Doctor Fitch was appointed to perform the work. He was not officially designated as State Entomologist but was always given this title by courtesy. He continued in office until 1872, when his last report was published and when the infirmities of age affected him to such an extent that he could no longer continue his investigations. His reports were published in the Transactions of the State Agricultural Society, from 1854 to 1870, skipping the years 1859, 1863 and 1868. The first 11 had been published separately as well as in the Transactions of the Society. From 1871 to 1879 he lived quietly at home, and was unable to furnish any further matter for publication. The value of his investigations today rests on his extraordinarily accurate observations on the habits of injurious insects. Practical entomology has developed so considerably that his remedial recommendations are out of date.

Flynn, Martin. By *Henry Wallace.*

Hon. Martin Flynn, railroad man and stockbreeder, for many years recognized as one of the leading Shorthorn breeders of the West, was born in County Waterford, Ireland, August 19, 1840. He died at Des Moines, Iowa, July 18, 1906. He emigrated to the United States with his parents in 1848. He was married in Omaha, Neb., in September, 1864. He reared a family of five sons and five daughters, all but two of whom outlived him. He was a devout member of the Roman Catholic church.

In untiring energy and capacity to bring things to pass, he was one of the remarkable men of the West. At nine years of age, he began his life work on the railroad by carrying water for a construction crew. He steadily advanced in the railroad work, and later was awarded many important contracts, among the most difficult of which was the Ratoun Tunnel on the Santa Fé railroad, which was finished in 1878.

In 1867, Mr. Flynn had purchased 640 acres near Des Moines, now known as Walnut Hill Farm, to which he afterward made additions, until at the time of his death it comprised 1,600 acres. After retiring from the business of railroad-building, he devoted himself to agricultural pursuits, bringing to bear on the various problems of the farm the same untiring energy, executive ability and clear perception of the great essentials that rendered him successful in his early career. He selected the Shorthorn as his favorite breed of cattle, making his first purchases in 1871, mostly Miss Wileys, Rose of Sharons and Young Marys. He crossed these native sorts with Bates bulls, and finally secured, at a great price, the celebrated 33d Duke of Airdrie. For many years Mr. Flynn was regarded, and justly, as the champion exponent of the Bates cattle, and Walnut Hill became the home of the best Bates families. While his first choice was the Bates, he was not slow to recognize the merit of the Scotch type, and, in 1890, began using Scotch-bred sires on some of his best Bates families, using first the noted bull, Golden Lord.

It is hard to estimate the influence of Martin Flynn in developing the pure-bred live-stock industries of the West. He was a prominent member of the Improved Stock Breeders' Association of Iowa, when in the height of its usefulness. He was an attendant at all the leading agricultural meetings. At the prominent sales, he was a liberal but judicious buyer of the best, and always a wise and competent counselor of the younger generation of breeders.

French, John Davis Williams. By *F. H. Fowler.*

John Davis Williams French, soldier, farmer, was born in Boston, Mass., January 29, 1841. He died after a short illness, at Atlantic City, N. J., May 2, 1900. He was graduated from Harvard College in the class of 1863. For several months after graduation he served with the Union army in the field.

Having a strong predisposition for country life, and being possessed of ample means, he bought a farm in North Andover, Mass., in 1867, called by him "Cochichewick Farm," where he led the life of a gentleman farmer in the summer, retaining his city residence in the winter. Mr. French greatly admired Ayrshire cattle, and owned many valuable specimens of the breed. He edited the Ayrshire Record (Herdbook), and was one of the founders of the Ayrshire Breeders' Association of the United States and Canada, serving as its secretary from 1875 to 1882, and as its president in 1882 and 1883. He was a pioneer student of the tuberculosis problem, having lost nearly all his herd from that disease. He was also president of the New England Milk Producers' Union, and worked broadly for the interests of both producers and consumers.

Forestry was Mr. French's hobby, and he did considerable in forest planting. At one time he received $1,000 from the Massachusetts Society for Promoting Agriculture as a prize for the best plantation of European larches in the state. He also served as corresponding secretary of the American Forestry Association.

Mr. French was connected with many organizations and had ample time to give to the service of others. As president of the Bay State Agricultural Society, for which he was largely responsible, he was a pioneer in bringing forward the teaching of cooking and of object-lesson dairy work at farmers' institutes. He was also identified with the Massachusetts Horticultural Society, the New England Agricultural Society, the American Agricultural Association, the American Guernsey Cattle Club, the Essex Agricultural Society, the Massachusetts Agricultural College and the State Board of Agriculture, at some period of his career.

He was especially prominent in Episcopal circles and was frequently a member of the Episcopal

Diocesan Convention. He was also identified with many literary, social and charitable organizations in his native city, and served in the common council in 1882–1885, where, as chairman of the Committee on Common (Boston) and Public Squares, he did good work.

Mr. French never married. He was a man of high ideals, strict integrity, progressive ideas, and was thoroughly loyal to agriculture. A lover of country-life in a broad way, he appreciated its beauties and was anxious to see them preserved and developed. Modest and retiring, yet public-spirited to an unusual degree, he was always ready and willing to give his time and money to all worthy and deserving objects. Though city born and bred, his summer experiences on his farm and the knowledge gained by wide travel peculiarly fitted him to take an active interest in progressive agriculture, in some branches of which he was considered an authority

Friberg, Andrew. By *G. A. Stephens.*

Andrew Friberg, farm-implement maker, was born in Sweden, April 8, 1828. He died at Lafayette, Ind., October 11, 1894. He learned the blacksmith's trade in his native city. He left home for America at the age of thirty-two. He came to Moline, Ill., in 1851 and immediately began to work for Deere, Tate & Gould, who were engaged in making plows. In a few months he was promoted to the position of foreman of the iron department, which place he held for twelve years. Probably the excellence of the steel plow is more directly attributable to the efforts of this one man than of any other plow-maker. His idea of curves in contradistinction to the prevailing angles of the period won for him success in plow-making.

He retired from duty with this firm in 1864. He went West for his health, and on returning to Moline engaged with the firm of Candee & Swan in the same year. The next year, he formed a partnership with these men, the firm being Candee, Swan & Co., and the manufacture of agricultural implements was then begun, Mr. Friberg acting as mechanical manager for the plant. Its success was marked and the growth of the company was rapid. He remained with the company until 1876, at which time he retired because of impaired health. In 1879, he again resumed active relations with the company, and maintained the same until 1894. Failing in health, he again severed his active relations with the company and made a fruitless attempt to recover his health.

Frotscher, Richard. (Fig. 132.)
By *Richard P. Steckler.*

Richard Frotscher, seedsman, horticulturist, was born in Leipzig, Saxony, March 15, 1833. He died February 2, 1896. He received a thorough education, and was trained specially in botany by his grandfather. In 1850, after one of the numerous democratic uprisings among the youth of Germany, he was forced to flee to America. He spent some time in Pennsylvania, and shortly after the Civil war went to New Orleans, where he entered on a long and successful career as seedsman and horticulturist, and did much to further agriculture in the South.

Richard Frotscher was the first to issue a business catalogue with reference to southern climatic and soil conditions. He was tireless in experiment and introduced many European fruits, vegetables and flowers into southern orchards and gardens. Under his care, certain varieties of southern vegetables were improved. Among his many introductions are the New Orleans Market Cucumber, New Orleans Market Melon, New Orleans Market Eggplant, Frotscher's Superior Large Late Flat Dutch Cabbage, Best-of-all Beans, Southern Willow-Leaved Sewee or Butter Pole Beans, Frotscher's Three-quarter Red Blood Turnip Beet, Frotscher's New Orleans Improved Large Passion Lettuce, Frotscher's Lone Star Watermelon, and Louisiana or Creole Onion. His introductions were numerous in fruit and shade trees and in flower and grass seeds.

Fig. 132. Richard Frotscher.

Systematic pecan-culture was begun by Richard Frotscher. The three varieties that he started to propagate and named, and which are recognized to-day as being the standards, are the Frotscher's Egg Shell, Rome and Centennial. Since that period many varieties have come into commerce, but the three varieties above mentioned are still looked on as the standard.

He married Miss Emilie Schwalm, who gave him active assistance in his business life. She survived him only a few days.

As a man, Richard Frotscher possessed great force of character, and this helped, in no small degree, to the success of his life work. As a citizen, he was honest and public-spirited. As a seedsman, he attained as great a reputation as any man in the South.

Fuller, Andrew S.

Andrew S. Fuller, horticultural writer, was born in Utica, N. Y., August 3, 1828. He died

May 4, 1896, at Ridgewood, New Jersey. He improved strawberries by cross-fertilization and selection, developing especially the Brooklyn Scarlet, Monitor, and Colonel Ellsworth. He wrote the Strawberry Culturist, Grape Culturist, Small Fruit Culturist, Practical Forestry, Propagation of Plants, and Nut Culturist. He was editor of the Record of Horticulture, in 1866–67, and was a voluminous contributor to the agricultural press. [See biography in Cyclopedia of American Horticulture, page 616.]

Furnas, Robert Wilkinson.

Robert Wilkinson Furnas, horticulturist, governor of Nebraska, was born in Miami county, Ohio, May 5, 1824. He died June 1, 1905. His parents were William and Martha (Jenkins) Furnas. They died when the boy was eight years old, leaving him to make his own way. He attended school and did whatever work he could to make a living, including an apprenticeship in printing. In 1844 he was in charge of a printing establishment in Cincinnati, and later published and edited the Troy (Ohio) Times. In 1845 he was married to Mary C. McComas, of Cincinnati, who died in 1897. In 1855, we find him editing and publishing the Nebraska Advertiser at Brownsville, Neb. When the war broke out in 1861, he was made colonel, in charge of three regiments of Indians organized by him. Later he was colonel in the second Nebraska cavalry. He was in the territorial legislature for four years, framed the first educational law of Nebraska, organized and became president of the board of agriculture, was president of the first territorial educational convention, and is said to have built the first school-house in the territory. In 1873–74, he was governor of Nebraska. He was president and secretary of the Nebraska State Horticultural Society, and was regent of the State University. He was author of a large number of Nebraska state reports on agriculture and horticulture. He was much interested in fairs, and was commissioner to several. In 1890 he settled on a farm and engaged in stock-growing and fruit-raising on an extensive scale. In 1901, he was married to Mrs. Susannah Jameson. [Adapted in part from The National Cyclopedia of American Biography.]

Gardiner, Robert Hallowell. See pages 366, 367.

George, James Zachariah. By *Samuel L. Gwin.*

James Zachariah George, soldier, statesmen, was born on his father's farm near Forsyth, Monroe county, Georgia, October 20, 1826. He died at Mississippi City, Miss., August 14, 1897, surviving his wife only a few days. His father having died in the boy's infancy, he removed with his mother to Mississippi, settling in Carroll county in 1836. At about eighteen, having acquired a good general education, he removed to Carrollton and studied law under Judge William Cothran, one of the foremost lawyers of his time in Mississippi.

In 1845, Mr. George went as a private in the First Regiment of Volunteers to Mexico. After his return in 1846, he began the practice of law. In May, 1847, he was married to Miss Elizabeth Brooks Young. In 1854, he was elected reporter of the High Court of Errors and Appeals, the highest appellate court of the state, now the Supreme Court, and was reëlected to this position in 1860. In 1861, he was a delegate to the Mississippi Secession Convention at Jackson, and shortly after the war between the states began, he joined the Confederate army and was in the service until 1865, although twenty-six months of this period was spent in Johnson's Island prison.

After the war, he returned to Carrollton and resumed the practice of law. In 1873, he moved to Jackson, where he became associated as partner with Judge Wiley P. Harris. This partnership continued until 1879, when Senator George was appointed Chief Justice of the Supreme Court of Mississippi, in which capacity he served until February 25, 1881.

In 1880, Mr. George was elected to the United States Senate from Mississippi, and took his seat on March 4, 1881. He remained a senator until his death in 1897.

While Senator George was first of all a lawyer, he was very devoted to agriculture, and lived in the country all his life. While in the Senate, by his own request he was made a member of the Committee on Agriculture and Forestry soon after he took his seat, and was ranking Democrat on the committee for years, serving as chairman during the two years from 1893 to 1895. He advocated and voted for the appropriation of money for the extermination of the Russian thistle, which then threatened to do incalculable injury to the farming interests of the West, and this in the face of much unfavorable criticism from his own party. He introduced a bill to prohibit dealings in options on agricultural products. He worked tirelessly for the elevation of the Bureau of Agriculture into an independent department with a representative in the cabinet. He labored for years for the establishment of an agricultural college in his own state. When the college was established, he served on the Board of Trustees from its opening until his death.

Gibb, Charles.

Charles Gibb, Canadian horticulturist and author of important works on Russian fruits and other hardy trees, was born at Montreal, June 29, 1842. He died at Cairo, Egypt, March 8, 1890. His chief works are, Ornamental and Timber Trees Not Natives of the Province of Quebec, Report on Russian Fruits, Hasty Notes on the Trees and Shrubs of Northern Europe, Russian Apples Imported by the Department of Agriculture, Washington, in 1870, Nomenclature of the Russian Apples, Of Translating and Rendering into Euphonious English Unpronounceable Russian Names, also Throwing Out Synonyms, and Fruits for the Cold North. In 1872, he brought to Montreal the first canned fruit exhibited in the Dominion of Canada. [See sketch in Cyclopedia of American Horticulture, page 642.]

Gideon, Peter M. (Fig. 133.) By *A. W. Latham.*

Peter M. Gideon, horticulturist, was born in Champagne county, Ohio, on February 9, 1818. He died at Excelsior, Minn., October 27, 1899. In 1841, he removed to Clinton, Ill., and twelve years later, in 1853, came to Excelsior. His homestead in Minnesota was located between the upper and lower lakes which together constitute Lake Minnetonka.

Fig. 133. Peter M. Gideon.

From the very outset he gave earnest thought to the origination of new varieties of fruit, impoverishing himself and his family to bring about this end. From the multitude of experiments he conducted, by far the most important fruit originated was the Wealthy apple. Later in life he put out the Peter, a variety almost identical with the Wealthy, though considered a somewhat better keeper. This is propagated more largely by northwestern nurserymen. Other varieties of value which came as a result of his efforts are the Gideon, the Lou, a crab-apple, the Gideon No. 6, and the Florence, another very excellent crab-apple.

Mr. Gideon was a man with a high ideal, and was a most indefatigable and persistent worker. Without question, his work had much to do with the interest so wide-spread in the Northwest to secure through similar methods varieties better adapted to this climate than those now available. Mr. Gideon sent out all over the Northwest thousands of seedling apple trees at a nominal price, many of which are bearing excellent fruit. Other fruit-growers are following in his footsteps, and in this way, if in no other, his work is living after him. He stands preëminent in his efforts to attain a specific ideal in the apple.

While Mr. Gideon's interest was principally in propagating apples, he had a general interest in anything pertaining to horticulture. He was a man of sturdy character, of resolution and determination equal to the persistent following of whatever task he undertook or purpose he considered true and right.

Glover, Townend. By *L. O. Howard.*

Townend Glover, the first entomologist of the United States Department of Agriculture, was born at Rio de Janeiro, Brazil, February 20, 1813. He died September 7, 1883. His father and mother were both English; his mother died while he was yet an infant, and he was sent home to England and placed in the charge of relatives at Leeds. As a boy, Glover was sent to a private school of high reputation, and began at an early age to make a collection of insects which he prepared and mounted with great skill. Later he was apprentice to the proprietors of a woolen goods warehouse, where he remained until twenty-one years of age. At the end of his apprenticeship he went to Munich, Germany, where he began to study fruit- and flower-painting in oil under Mattenheimer. He remained in Germany two years, and acquired a high degree of proficiency in a somewhat limited range of fruit- and flower-painting. At the end of two years he visited America. He had no intention of making more than a short visit, but he never went back to England except for two short visits years afterward. For four years he traveled in America, collecting insects, birds and plants. He married Miss Sarah T. Byrnes, of Fishkill-on-Hudson. He lived at Fishkill for ten years, leading the life of a country gentleman, busying himself with the care of fruit and ornamental trees and his garden. He met here A. J. Downing, the author of Fruits and Fruit Trees of America, became deeply interested in pomology, and elaborated a system of illustrating American fruits by a series of perfect facsimiles. He exhibited this collection at various state fairs, and acquired a high reputation as a pomologist. He was eventually invited to take his models to Washington for exhibition. He arrived at Washington in the winter of 1853, at the time the new Bureau of Agriculture was about to be established in the United States Patent Office, and received the appointment of "Expert for collecting statistics and other information on seeds, fruits and insects in the United States." He held the dual position of Entomologist and Special Agent. He studied the insects of many crops, especially those affecting cotton and the orange, and, with the exception of a brief interval when he resigned his position and went to the Agricultural College of Maryland, where he taught entomology, he remained connected with the Department until 1878, writing nearly everything on the subject of insects that appeared in the annual report, and engaging himself in the preparation of a great illustrated work on the insects of the United States. Systematic and descriptive entomology he cared nothing whatever about, and it was his boast that he had never described and named a new species. Aside from the annual reports, Glover published in a peculiar and eccentric manner, which was characteristic, two or three volumes. The plates for these volumes, illustrations and text, he etched on copper, printed them in an edition of fifty copies only, and deposited them in the leading libraries of the country.

The text is simply descriptive of the plates, although it contains certain bibliographical references. He also built up a creditable agricultural museum. His health failed in 1878, and he remained an almost helpless invalid for five years until his death.

Goff, Emmett Stull. (Fig. 134.)
By *Frederic Cranefield.*

Emmett Stull Goff, horticulturist, was born at Elmira, N. Y., September 3, 1852. He died at Madison, Wis., June 6, 1902. His boyhood days were spent on a farm and in attending the common schools of New York. In 1869, he was graduated from the Elmira Free Academy. For several years after graduation he was associated with his father and brothers in fruit- and tobacco-raising and general farm work. Later, he accepted a position as associate editor of an agricultural paper, but finding this work unsuited to his tastes, returned to the farm. In 1882, he was elected horticulturist at the New York State Agricultural Experiment Station, Geneva, but then recently established.

The first work taken up by Goff at Geneva was the classification of garden vegetables and their botanical relationship. Thousands of varieties of vegetables were grown. In one year we find described ninety-eight varieties of pea, eighty-four of lettuce and eighty-five of cabbage.

Fig. 134. Emmett Stull Goff.

In connection with this, we find records of extensive investigations of the root systems of plants, the first recorded work of this kind. Experiments were begun in plant-breeding, one of which, the effects on the tomato of the use of immature seed, was continued for fourteen years. At this time, 1885, the practice of spraying was wholly undeveloped. It is a matter of record that the first regular experiment station to publish results of the use of Paris green for controlling the codling-moth was the New York Station, and the first systematic trial of this valuable remedy was made by Goff. In the sixteen years following, Goff was associated with every important advance in the use of insecticides, fungicides, and spraying apparatus. The kerosene attachment for spray pumps and the cabbage-plant protector, both of which were devised by Goff, are two of the most valuable devices known for the control of insects. The first systematic experiments for the control of apple-scab were conducted by him, using hyposulfite of soda and sulfid of lime.

In 1889, Goff was elected to the chair of horticulture in the University of Wisconsin, being the first to fill this position. His work here for a number of years consisted largely of a horticultural survey of the state and what is now called "extension" work. He devoted much time to the development of the native plum.

Goff's investigations of a scientific nature include: The Influence of Heredity on the Vigor of the Potato; Conditions Affecting the Starch Content of the Potato; The Origin of Development of Fruit-Buds, the last named being his best work, and although but fairly begun at the time of his death, led to conclusions of great practical value to fruit-growers. Up to that time there had been no systematic study of the time when fruit-buds form nor of the conditions favoring their development. A record of this work appears in the reports of the Wisconsin Agricultural Experiment Station for 1899 and 1900. In connection with his instructional work in the University and as an outgrowth of classroom work, three books were written and a fourth begun, viz., The Principles of Pomology, The Principles of Fruit Growing, and The Principles of Plant Life. Lessons in Agriculture, designed as a text in the common schools, was completed and published by his executors.

As a teacher, Mr. Goff sought always to teach principles rather than facts; as an investigator, his work was marked by originality, completeness and persistence. Quiet of demeanor, of unimpeachable character and exemplary habits, his influence on the young men of his classes and his associates must be reckoned in summing up his life, no less than his achievements in his chosen field of work.

Gold, Theodore Sedgwick. (Fig. 135.)
By *E. H. Jenkins.*

Theodore Sedgwick Gold, teacher, farmer, first secretary of the Connecticut Board of Agriculture, was born in Madison, N. Y., March 2, 1818, and died March 20, 1906. In his infancy, the family moved to Connecticut, first to Goshen and then to the ancestral property (Cream Hill) of 400 acres, in West Cornwall, which became Mr. Gold's home for sixty-four years. He was graduated from Yale College in 1838, and, after teaching for three years, returned to the farm, never to leave it for any other business. He established there an agricultural school, known as the Cream Hill Agricultural Institute, which he and his father conducted for twenty-four years.

Mr. Gold was active in organizing the Connecticut Agricultural Society, in 1853, and served for years as a director. He was an organizer of the Connecticut Board of Agriculture in 1866, and was elected secretary, an office that he held continuously for thirty-four years. He earnestly supported the movement that resulted in the establishment of the Connecticut Agricultural Experiment Station, in 1875, and was a member of its Board of Control until his death, representing the State Agricultural Society. He was active in behalf of the foundation of the Storrs Agricultural School at Storrs in 1887, and was for twenty years a trustee of the school and college.

Fig. 135. Theodore Sedgwick Gold.

The scope of Mr. Gold's interests and associations is indicated by his membership in the American Association for the Advancement of Science (of which he was a Fellow), the American Pomological Society, the American Forestry Association, the Connecticut Forestry Association, the National Geographic Society, the American Historical Society, the Connecticut Historical Society, the Sons of the American Revolution, and Founders and Patriots. He was always a student, an extensive reader on subjects relating to natural science, a man having wide acquaintance with men of learning and prominence, and, withal, an excellent practical farmer. At one time an editor, he was for more than sixty years a frequent contributor to the agricultural press. He had an earnest religious nature; was an officer in his church for over thirty years, and a public-spirited, patriotic citizen.

His greatest work was the management of the State Board of Agriculture for thirty-four years. When there were no granges, no farmers' institutes, no field meetings to bring farmers together, he made the winter meetings of the Board the great rallying place for all intelligent farmers. Mr. Gold was greater than his work. His work for his state was greater than can be registered in a catalogue of things done, for he was a force which still lives and works.

[For a discussion of the origin and history of the Cream Hill School, and notes regarding the course of study, see page 369. Fig. 102 gives a picture of the school from an old print.]

Goodale, Stephen Lincoln. (Fig. 136.)
By *S. L. Boardman.*

Stephen Lincoln Goodale, druggist, horticulturist, was born in South Berwick, Maine, August 14, 1815. He died in Saco, Maine, November 5, 1897. He was the son of Enoch Goodale. The year following his birth, his father settled in Saco, where the entire subsequent life of Mr. Goodale was passed. He had but little education from the schools, the education of his father's drug business being considered better, and at thirteen years of age he entered the Thornton academy where he remained for three years. He then returned to his father's store. He became proficient in business and at the age of twenty-two succeeded his father. The chemical and botanical studies required in pharmacy he extended and and applied to gardening, horticulture and crop-production, becoming acquainted with agriculture and horticulture as then practiced. He was married in Bangor, Maine, September 23, 1838, to Prudence Aiken Nourse, by which union five children were born to him.

In 1841, Mr. Goodale established a commercial garden and nursery in Saco, which became famous. Here he devoted his extensive grounds to scientific horticulture and arboriculture, where he had testing grounds and the finest collection of fruit trees, shrubs, vines, ornamental plants for open air and glass-culture in Maine. In 1856, he was chosen secretary of the Maine State Board of Agriculture, which position he held for sixteen years. The sixteen volumes of reports edited by Mr. Goodale between 1856 and 1872, embrace a body of information on the agriculture of Maine, larger in amount and more important in character than has been contributed by another single hand in the history of the state. In 1861, he published The Principles of Breeding, or The Physiological Laws Involved in the Reproduction and Improvement of

Fig. 136. Stephen Lincoln Goodale.

Domestic Animals, which was one of the earliest treatises on the subject. In 1869, he became a trustee of the State College of Agriculture and Mechanic Arts (now University of Maine), holding the position for three years.

Mr. Goodale was for many years interested in the manufacture of commercial fertilizers, being president and chemist of one of the largest companies in the state, the Cumberland Bone Company. With the late Gail Borden, he was interested in condensed milk and assisted in starting a factory for its manufacture in Maine, as early as 1863. He was also interested in the manufacture of beef extract by the Liebig process and in the hybridizing of fruits. His interest in science and letters found expression in his being one of the incorporators of the York Institute as early as 1867.

Mr. Goodale was always a student and for forty years pursued studies and experiments in the application of science to plant life, in which subject he conducted extensive correspondence with eminent scientists in this country and abroad.

Goodall, Harvey L.

Harvey L. Goodall, founder of the first daily live-stock and agricultural paper, was born at Luenburg, Vermont, May 28, 1836. He died March 28, 1900. He spent his boyhood on a farm, where he lived until he was sixteen. In common with farm boys of that period, he enjoyed the limited educational advantages of the times. Young Goodall made the best possible use of his time and read with much eagerness all the books he could buy or borrow. Not being satisfied with his limited surroundings, he left Vermont, when he was sixteen, to see the world and work out his own destiny. From that time his career was a checkered one. At first he was a sailor, going to the Old World where he had a varied experience, then he became a cotton mill superintendent, merchant, tradesman, news agent, restaurant keeper, printer, circus manager, railway conductor, soldier, scout and finally a newspaper man of much prominence.

His work for the advancement of the live-stock industry and agriculture began January 11, 1873, when he established his live-stock market paper. For several years he had been issuing weekly market circulars, but appreciating the live-stock interests of the great West and Northwest, and that Chicago had become the focus and distributing point of this growing industry, he decided to issue a live-stock paper. At first the Drovers Journal, the name of the new paper, was published once a week. By 1877, the trade had greatly expanded, and Mr. Goodall saw the demand for a daily edition of the paper, which he started. This, with the weekly and semi-weekly editions, have been issued regularly ever since.

For several years previous to his death, Mr. Goodall was in poor health, brought on by hard work and close application to the many details of a rapidly growing business. His wife was his faithful companion and adviser through his long illness, and at his death assumed sole management of the business, of which she is the head today. Whatever influence the Drovers Journal has lent to the advancement of American agriculture, and more particularly to the live-stock industry, is due to the enterprise, originality, genius and tireless industry of its founder.

Goodell, Henry Hill. By *W. E. Stone.*

Henry Hill Goodell, educator, son of the Rev. William and Abigail Goodell, was born in Constantinople, Turkey, May 20, 1839, and died April 20, 1905. He prepared for college at Williston Seminary, Easthampton, Mass., and was graduated from Amherst College in 1862. He was commissioned second lieutenant, Company F., Twenty-fifth Connecticut Volunteers, August 16, 1862; first lieutenant, April 14, 1863, and was appointed aid-de-camp on the staff of Colonel Bissell, of the Nineteenth Army Corps, July 8, 1863. He participated in the engagements in Louisiana of Irish Bend and Vermillion Bayou, in the siege of Port Hudson, and in the Teche campaign, and was mustered out of the service August 26, 1863.

From 1864–67 he was an instructor in Williston Seminary, and at the opening of Massachusetts Agricultural College, in 1867, was appointed Professor of Modern Languages and English Literature. In 1886, he was elected president of the college, and, in 1887, director of the experiment station, filling both these offices until his death. He was an original member and one of the founders of the American Association of Agricultural Colleges and Experiment Stations, president of the association in 1891, member of the executive committee from 1888 to 1902, and chairman of the same from 1894 to 1902. In the spring of 1905 he went to Florida to recuperate from an acute illness, and, being homeward bound, died on shipboard in Boston Harbor, en route from Savannah to Boston.

The last thirty-eight years of Mr. Goodell's life were devoted singly to the work of establishing and advancing agricultural education. This was accomplished in part through his life work in the Massachusetts Agricultural College, where, at different times, he filled the position of professor, librarian, secretary of the faculty, acting president, president, and director of the experiment station. His teaching was in the departments of literature, languages, and history, consequently he made no technical contributions to agricultural science, except indirectly in the training and inspiring of young men who have become valued workers in the field. The library of his college became one of the best collections of agricultural literature in the country, through his personal efforts.

Mr. Goodell's efforts in connection with the organization and development of the American Association of Agricultural Colleges and Experiment Stations were of national scope. With the passage of the Hatch Act, in 1887, it became apparent that an organization of the executive officers of these institutions was a necessity. In the organization of this association he was a moving spirit, and in its subsequent work always an active participant. His rare tact and insight into human nature; his broad outlook on the field of agricul-

Plate XXIV. Scene on the campus of the Land-Grant institution of Louisiana. Louisiana State University, Baton Rouge

ture; his wide knowledge of public men, and thorough familiarity with the history of the Land-Grant college movement, fitted him for the place of leader in the work of the executive committee, and enabled him to render inestimable service. The attention of Congress and of governmental departments has been favorably molded by the wisdom and firmness of this committee. The threatening danger to the federal appropriation to the colleges and experiment stations, through the gradual diversion of the proceeds of the sale of public lands, was foreseen and averted through his efforts and leadership in securing protective legislation in 1900. His conservative and wise but energetic action averted many dangers and laid foundations which will sustain the Land-Grant colleges for a long time to come.

Goodrich, Chauncey. By *J. E. Goodrich.*

Chauncey Goodrich, bookseller, horticulturist, was born September 10, 1798, and died September 11, 1858, in Hinsdale, Mass. His father was a farmer. After gaining such education as the public schools afforded, he became a teacher in them. At the age of nineteen, he entered a publishing house in Hartford, Conn., but in 1823 began bookselling on his own account in Castleton, Vt. Five years later he removed to Burlington, Vt., where to the business of bookselling he added that of printing and publishing. His list of publications contained treatises on law, philosophy, theology, history, and school books. The making and selling of books was his vocation; his chief avocations were farming and gardening. He tested on his own grounds such fruits as seemed likely to flourish in the Champlain valley and the regions adjacent, and lost no opportunity to urge farmers to cultivate those fruits that were peculiarly suited to their locality. He maintained nurseries on his farm in order to supply the needs of such persons as could be induced to start an orchard or fruit-garden. In 1850, he issued the second edition of a little manual, The Northern Fruit Culturist, or Farmer's Guide to the Orchard and Fruit Garden, specially designed to spread a knowledge of select hardy varieties and the methods of culture required in the more elevated sections of the northeastern states.

Mr. Goodrich was active in the formation and management of the Champlain Horticultural Society, the territory of which included both shores of the lake and the islands. He was an occasional contributor to Downing's and Hovey's magazines, as also to the agricultural papers of Albany and Boston. Wherever he went, he acted as a sort of horticultural missionary, and used often to affirm that the practical Christianity of any community was to be tested by a literal application of the text, "By their *fruits* ye shall know them." Probably no other man did more to extend and improve the culture of fruits in northern New York and Vermont.

He was sometimes brusque in manner and speech, but this seeming rudeness masked a spirit of generous sympathy, as could be witnessed by many whom he helped to begin a business career, or to pursue a college course of study. In 1828, he married Arabella Marsh, a sister of President James Marsh, of the University of Vermont. His wife died in 1835, leaving two daughters to his care.

Gray, Asa.

Asa Gray, botanist and naturalist, was born in Paris, Oneida county, N. Y., November 18, 1810. He died in Cambridge, Mass., January 30, 1888. His first book, the Elements of Botany, appeared in 1836. His Lessons appeared in 1857; Botanical Text Book, in 1842 (6th ed. 1879); How Plants Grow, in 1858; How Plants Behave, in 1872; Synoptical Flora of North America, began to appear in 1838; Manual of the Botany of Northern United States, in 1848 (6th ed. 1889); Field, Forest and Garden Botany in 1868; Darwiniana; Natural Science and Religion; Relations of the Japanese Flora to that of the United States. [Biographical sketch in Cyclopedia of American Horticulture, page 684.]

Greeley, Horace. By *F. H. Hall.*

Horace Greeley, printer, editor, congressman, was born February 3, 1811, in Amherst, N. H., and died November 29, 1872. His parents were Zaccheus and Mary Woodburn Greeley. He spent his years until he was nineteen in Amherst, and in Westhaven and East Poultney, Vt. Although a feeble and sickly child, he was a mental prodigy, and in his short and interrupted schooling, which began when he was only three years of age, he easily outstripped those many years his senior. Throughout his early life he was an omnivorous reader and had the faculty of remembering accurately what he read. His childhood and youth were filled with hard work, owing to the poverty of his parents, and the hard work and lack of recreation followed him through his four years' apprenticeship in a printing office at East Poultney, Vt., and, later, in Jamestown and Gowanda, N. Y., Erie and Wilkes-Barre, Pa.

On August 17, 1831, Greeley went to New York, an awkward, lanky, country boy with many uncouth ways, poorly supplied with money and clothes, but with a good knowledge of his trade and with a marvelously stocked mind and great capacity for literary work. In 1832, with a partner he opened a printing office, for job printing principally. In 1834, the new firm started the New Yorker, a literary weekly. This gave opportunity for Greeley to show something of his genius for editorial work and led to his selection, four years later, to edit the Jeffersonian, a Whig campaign paper. His success with this encouraged him to edit and publish the Log Cabin, a weekly, which soon reached a circulation of 80,000 and firmly established his ability as a most effective political writer. The venture was not very remunerative, financially, but gave him confidence to start the New York Tribune. The first number appeared April 10, 1841. The daily met with immediate success, and he soon established the weekly, discontinuing both the New Yorker and the Log Cabin. In its two editions, the Tribune soon became one of the most influential papers in America. In its columns, his appeals for better farming were ably supported by the discussions of agricultural topics by Solon Robinson, the Tribune's agricultural editor. In hundreds of lines, Greeley exerted a powerful influence through the Tribune, and the paper became a great financial success as well; but, by this success, Greeley did not profit as did others. To meet present needs and the ever-increasing demands on his ever-responding benevolence, he gradually disposed of his holdings in the property, so that, at his death, he was receiving little more from the Tribune than his editorial salary.

In 1848, Greeley was elected to Congress to fill a short-term vacancy. He introduced many measures that were later received with almost unanimous popular approval; but he was unfortunate in the time or manner of the introduction and management of them, so they received scant attention or met successful opposition. Among these measures were the forerunner of the Homestead Act, cheap postage, mileage reform and restriction of the franking privilege. Greeley was a Republican in politics, but independent in his actions and criticisms. Abolitionism and protection of American industry he urged, in season and out. But his course at the close of the war in urging general amnesty and in aiding the release of Jefferson Davis, by going on his bail bond, made many of his former friends bitter enemies. He was a member of the American Institute, whose Farmers' Club, in his day, was an influential organization. He wrote What I Know of Farming, a book which was circulated widely.

Greeley's independence and his opposition to certain acts of the outgoing administration led to his nomination for President in 1872, by the Democrats and Liberal Republicans, in opposition to General Grant, but he was overwhelmingly defeated. The strain of the campaign and of watching by the bedside of his dying wife brought on a severe attack of insomnia, from which he had frequently suffered. This was followed by inflammation of the brain, from which his death resulted.

Grinnell, Josiah Bushnell. By *Newton B. Ashby.*

Josiah Bushnell Grinnell, minister, farmer, statesman, was born in Vermont in 1821, his parents being farmer folk. He died in Iowa in March, 1891. He educated himself for the ministry, and for three years preached for the Union Congregational Church in New York City. A throat affliction forced him to give up this work, and he turned his attention toward the West. Mr. Grinnell was the young man to whom Horace Greeley gave the advice, "Go west, young man, go west and grow up with the country." He came to Iowa and founded the town of Grinnell in about 1853. During his forty years in Iowa, he held many offices, elective and appointive. He served as state senator from 1856 to 1860; was elected to Congress in 1862 and in 1864, and refused to make a canvass for a third term; was special agent of the Post Office Department for the Northwest under President Lincoln; was arbitrator in the adjustment of wool schedules. In 1884, he was chosen by the National Cattle Association as chairman of the committee on pleuro-pneumonia to draft a bill and secure its enactment by Congress.

Mr. Grinnell advocated the formation of a colony of people united by church ties and desirous of educational and church facilities, and so drew together a few kindred spirits. It was thus the town of Grinnell was founded. The town was made strictly temperate. In his new home he early set apart a tract of land for a college; this was the beginning of what later became Iowa College. He promoted and helped to construct railways at a personal financial loss, in order to bring cheap lumber and coal to a country which required these essentials for its development. He distributed free of charge a large number of apple-tree seedlings in order to stimulate the planting of orchards.

Mr. Grinnell saw that the greatness of Iowa was to be measured by the development of its agriculture, and he gave his best efforts to advancing its agricultural interests. Later, while president of the Iowa Horticultural Society, he received a gold medal from the National Horticultural Society because of his services to Iowa horticulture. He introduced the Norman and Clydesdale horses and Devon cattle into Iowa. He helped organize the Iowa Fine Stock Breeders' Association, of which he was president. He was president of the Iowa Wool Growers' Association, and strove to encourage sheep-growing in Iowa and the building of local woolen mills. He became a large flock owner, and devoted much time to the improvement of the breeds of sheep and the quality of the wool, importing many good sheep.

Gue, Benjamin F. By *Newton B. Ashby.*

Benjamin F. Gue, author, editor and politician, was born in New York state in 1828. He died in Des Moines, Iowa, in 1904. His education was limited to the public schools of that time and a few terms in academies. He came to Iowa in 1852, and settled on a claim in Scott county. He was a strong abolitionist, and took a deep interest in the politics of the state from the first. He was a delegate to the convention that organized the Republican party of the state in 1856. He was chosen in 1857 as the representative in the Seventh General Assembly of the state. In collaboration with Mr. Wright, he framed the bill to establish a state agricultural college, and secured its passage in the face of an adverse report from the Committee of Ways and Means. He was reëlected to the House, and at the end of his second term was elected to the state Senate, where he served four years. In the Senate, his most important work was the drafting and carrying through of a bill by which the state agricultural college secured an immediate income from the college land-grant, without parting with the land. In 1865, Mr. Gue was elected Lieutenant-Governor of the state, serving for four years. In 1866, he became president of the board of trustees of the state agricultural college, and for several years devoted all his leisure time to this institution. He secured, against much adverse influence, the converting of the college into a co-educational institution. In 1864, he removed to Fort Dodge, Iowa, where he purchased and edited for eight years a Republican paper. 1872, he removed to Des Moines and became editor of the Iowa Homestead, at that time and for some years the only weekly agricultural paper in the state. He continued to edit the Homestead intermittently until 1883, from which time until his death he was engaged on his history of Iowa—a very complete history of the state in four volumes.

Hale, Benjamin. By *S. L. Boardman.*

Benjamin Hale, educator, minister of the gospel, was born in Newburyport, Mass., November 23, 1797. He died at the same place, July 15, 1863. He took a partial course at Andover Theological Seminary, and was licensed to preach as a Congregational minister, but later he engaged in educational studies and became a tutor in Bowdoin college. He was the first president of the first agricultural and industrial or technical college in all North America, the Gardiner Lyceum, which was founded through the munificence of the first Robert Hallowell Gardiner, and incorporated by the legislature of Maine in 1821. To the shaping of the Lyceum and arranging its courses of study, the fine judgment of Mr. Hale, his conception of the character of the new institution and his enthusiasm and ability to put his ideas into effectual working, were of great value. He was president of the institution from 1823 to 1827. During this time, he organized regular courses in agriculture, surveying, navigation, chemistry, civil architecture and carpentry; while in short winter classes were also given instruction in elective studies, these classes corresponding to the short winter-courses in agriculture, horticulture, poultry-culture and dairying now given at most of the agricultural colleges in the United States.

In 1827, Mr. Hale resigned the presidency of Gardiner Lyceum to become professor of chemistry in Dartmouth college, where he gave courses of lectures and founded the geological and mineralogical cabinet. He occupied this position till the year 1835, when he left and took orders in the Protestant Episcopal church, 1835-6. The winter of 1836 was spent in the West Indies for his health. Returning, he was chosen president of Hobart College, Geneva, N. Y., which position he held till January 19, 1858, when he resigned because of declining health, and returned to his birthplace.

Mr. Hale's published works are, Introduction to the Mechanical Principles of Carpentry, Boston (1835); Scriptural Illustrations of the Liturgy.

Hallowell, Benjamin. By *M. Kirk.*

Benjamin Hallowell, educator, was born August 17, 1799, in Cheltenham township, Montgomery county, Pa. He died September 7, 1877, after many years residence on his farm in Sandy Spring, Md. His family were all members of the Society of Friends. He was educated in the school of John Gummery, Burlington, N. J., which enjoyed a great reputation. In 1825, Mr. Hallowell established the "Alexandria Boarding School," and for forty years conducted an institution that was renowned through Maryland, Virginia and the South. He was a profound mathematician, and as an astronomer was widely known. He was the author of a number of text-books. He was made president of the Maryland Agricultural College at its opening, but his health failed him utterly, and he was compelled to relinquish the position after its first session. With all his acquirements, he was the most modest of men; his kindly disposition attracted his students and bound them to him with ties that were life-long. The best interest of the rising generation was his constant theme.

Hammond, Edwin. By *George Hammond.*

Edwin Hammond, sheep-breeder, legislator, organizer, was born in Middlebury, Vt., May 20, 1801, and always lived within a few rods of his birthplace. He died December 31, 1870, leaving a widow and two sons. He was a descendant of an English family that came to America and settled in Rhode Island in 1634. At an early age, together with his brother William, he commenced farming and breeding sheep, cattle and horses, at one time keeping as many as 1,000 sheep, Saxony exclusively. He found it unprofitable to breed this class of sheep, and his attention was turned to Merinos. There had been a few of the latter breed imported into Vermont from Connecticut, and they pleased him so well that in January, 1844, he went to Connecticut and made his first purchase of Merinos from Stephen Atwood. Subsequent purchases were made in 1845 and 1846. He was well situated for breeding sheep. About 1850, the improvement of his flock began to attract public attention, and prominent sheep-breeders sought the sheep bred by him. The reputation of his flock became worldwide, extraordinary demand for them arose, and prices became fabulous. So great grew the fame of the Hammond flock that visitors came from many sections of the country to see them. He was known as the leading breeder of his time, and made greater and more rapid strides in the improvement of Merino sheep than any other breeder of his day.

In other departments of agriculture, Mr. Hammond was a prominent figure, being one of the founders of the Vermont State Agricultural Society, and its president for a number of years. He organized the Addison County Agricultural Society and gave his aid and advice in the formation of the New England Agricultural Society and to the National Wool-Growers' Association. He was one of the executive committee of the latter, and assisted in framing the schedule on wool and woolens which formed the basis of the Tariff Act of 1867. He appeared before the Ways and Means Committee of the House of Representatives to present its claims. He represented his town in the General Assembly of Vermont in 1858 and 1859. In 1864, he was delegate from Vermont to the National Republican Convention. He was also a member of the Corporation of Middlebury College for many years, to the support of which he contributed liberally.

In stature, Mr. Hammond was tall and erect, his countenance was animated and his manner dignified, affable and unassuming. His character was formed amid varied and somewhat severe discipline.

Haraszthy, Colonel Agoston.

By *Frederic T. Bioletti.*

Colonel Agoston Haraszthy came to Sonoma, Cal., in 1856, from Los Angeles, where he had been growing grapes. He planted the Buena Vista vineyard near Sonoma. He was commissioned by the governor of California to travel in Europe in the interest of California viticulture. An account of his trip and a general treatise on grape-growing and wine-making was published by him on his return, under the title of Grape-culture, Wines and Wine-making (Harper & Brothers, New York, 1862). On his trip he collected a very large number of varieties of grapes, which he sent to California. Many of these varieties are undoubtedly still growing there, but, owing to defective labeling, we do not know which we owe to him. He is usually credited with having introduced from Hungary the principal wine grape, the Zinfandel. This variety is said to have been found growing in his collection without a name, and to have been given this name by Haraszthy. Neither the variety nor the name have yet been traced back to their European origin. Colonel Haraszthy and his son, Arpad Haraszthy, were the first to make a success of manufacturing champagne in California by the natural process of fermentation in the bottle, and his brand of "Eclipse" was long the only domestic champagne in the market.

In 1868, Colonel Haraszthy removed to Nicaragua, where he became actively engaged in various pursuits. On July 6, 1869, he mysteriously disappeared. He is supposed to have fallen into a river which he was attempting to cross and to have been devoured by alligators.

Harrington, Charles.

Charles Harrington, professor of hygiene, secretary of Massachusetts State Board of Health, was born in Salem, Mass., in 1857. He died at the Castle hotel, Lynton, Devonshire, England, September 11, 1908. He was a graduate of Harvard College and the Harvard medical school; took postgraduate courses at Leipzig, Strasburg, and Munich. He returned to Boston in 1883 and began his career as an educator at the Harvard Medical School, by receiving first an appointment as assistant instructor in chemistry; later he was made instructor, and from 1889 to 1906 was an assistant professor in the same institution. He lectured extensively on materia medica and on hygiene. In 1906, he was appointed professor of hygiene at the Harvard Medical School and retained the professorship up to the time of his death.

Dr. Harrington was appointed inspector of milk and vinegar in Massachusetts in 1889, and conducted this work in addition to his teaching. In 1904, he became secretary of the State Board of Health, which position he held till his death. He was very active in the enforcement of pure-food and health laws. In June, 1908, in a lecture before the American Medical Association, he urged that the care of the public health should be centered in a department, represented in the cabinet or in a division of an existing department. In the Massachusetts legislature he secured the passage of the bill making it a felony to sell cocaine mixtures. He led the agitation which resulted in the passage of a bill requiring that sterilized milk be labeled, and setting a standard for sterilized milk. Both in the way of lecturing and in preparing papers, Professor Harrington led a successful campaign against unclean milk; and he also instituted a system of dairy inspection for the state of Massachusetts for which he was highly commended. His efforts in a crusade which he led against unclean milk amply demonstrated the wisdom of that innovation.

Dr. Harrington was a scientist of wide reputation. As a food analysist he was specially well known. His most important work in this line was finding the alcoholic contents of some proprietary medicines, his investigations with regard to boron compounds, and the use of sulfur dioxid preservatives in foods.

He was the author of the well-known book on Practical Hygiene, now used as a text in many schools. [Adapted from obituary notice in Boston Herald, September 12, 1908.]

Harris, John S. By *A. W. Latham.*

John S. Harris, horticulturist, was born in Seville, Medina county, Ohio, August 17, 1826. He died March 24, 1901. His ancestors were among the founders and defenders of this country, and his parents, Samuel Harris, of Connecticut, and Mabel Gibbs, of Massachusetts, were among the hardy pioneers of northern Ohio. His father was a thorough, practical farmer, an enthusiastic pomologist and gardener, and under his instruction the lad soon became a skilful propagator of trees and plants, at the early age of eleven years starting and managing a nursery and garden of his own. In the spring of 1847, he enlisted in the Fifteenth United States Infantry and served in the war with Mexico. After his return, he remained in Ohio a year, and then traveled in the West, especially in Wisconsin, Illinois and Iowa, to recover his health.

In the summer of 1851, Mr. Harris located at LaCrosse, engaging in the market-gardening business. On December 24, of that year, he was married to Melissa J. Clayton, who, with four children, survived him. In 1856, he moved across the river to La Crescent, Minn., where the soil was better adapted to his horticultural work, and started in gardening and fruit-growing. Practically all of Mr. Harris' experiments in fruit-culture and the development of new fruits in Minnesota, which have given him a name throughout the Northwest, were made on his place at La Crescent. He planted his first orchard in 1857, and continued to plant more or less trees every year thereafter, planting for trial every choice American variety of apples of which trees could be procured, together with pears, plums, cherries, grapes and other small fruits. In 1866, at the state fair held in Rochester, where he was the largest exhibitor of home-grown fruit, he assisted in the organization of the Minnesota State Horticultural Society, now the largest horticultural association in membership in this country. Mr. Harris' name appears first on the roll of charter members. In 1868, he was elected vice-president, and the year following president, which office he held for three years. Again, in 1881 to 1884, he was president of this society, and from then until his death was a member of the executive board. In 1875, he was chosen a member of the board of managers of the State Agricultural Society, holding that position for twelve years. From before the date of the organization of this society up to the very year of his death, he was easily the largest exhibitor of fruits at the state fair. As a member of this society, it is impossible to say too much for the fidelity and untiring zeal he manifested in its service. His work as a member of the committee on seedling fruits and the committee on nomenclature was of special value.

Harris, Joseph.

Joseph Harris, agricultural author, was born June 29, 1828, in Shawbury, England. He died at Moreton Farm, near Rochester, N. Y., November 18, 1892. His Walks and Talks on the Farm appeared in the Genesee Farmer, in 1864–65, and were continued in the American Agriculturist when the latter purchased the Genesee Farmer. In all, there were 171 chapters of these Walks and Talks. He wrote Harris on the Pig, Talks on Manures, The Use of Nitrate of Soda, and Gardening for Young and Old. [For picture and biography, see Cyclopedia of American Horticulture, page 711.]

Harris, Thaddeus William. (Fig. 137.)
By *L. O. Howard.*

Thaddeus William Harris, entomologist, writer, Librarian of Harvard College, was born in Worcester, Mass., November 12, 1795. He died January 16, 1856. He was the son of Rev. T. M. Harris, for a time Librarian of Harvard College and the author of a Natural History of the Bible, published in 1820. From both his father and mother, Harris inherited a love for natural history, but did not begin his collection of insects until 1820. He was graduated from Harvard in 1815, and, while there, attended the lectures of Prof. W. D. Peck, who was the first writer on economic entomology in America. During his undergraduate days at Harvard, and for five years afterward, he was preparing for the study of medicine, and took his medical degree in 1820, beginning practice at Milton, Mass., in connection with Doctor Holbrook, whose daughter he afterward married. While waiting for a practice, and even after it had begun to come, he collected assiduously and contributed articles on entomological subjects to the New England Farmer. In 1831, he received the appointment of Librarian of Harvard College, and held the position until his death in 1856. In addition to his librarianship, he held a quasi-scientific position in the college, and gave an annual course of lectures on natural history to the senior class. The routine of his library duties was not exhausting, and he worked with diligence at his insects. Neither he nor the College Library possessed any works of importance on entomology. He therefore borrowed books from his correspondents, and gradually brought together a great number of manuscript volumes, into which he had copied and translated everything in the way of entomological literature which he could procure. He contributed very largely to the scientific, agricultural, and other periodicals, and worked through life with the idea that he might eventually publish a monograph of the insects of North America. His first work of importance was a catalogue of insects appended to Hitchcock's Massachusetts Geologic Report, published in 1831. Some years later, he was appointed by the state a member of a scientific commission for a thorough geological and botanical survey, in which he prepared his famous report on the insects injurious to vegetation, first published by the Survey in 1841, and a year later reprinted by himself under the name "Treatise" instead of "Report." It was again printed, in a revised form, in 1852. The compensation that he received from the state was $175. After his death the treatise was reprinted by the state in admirable form, with illustrations which marked an epoch in the art of wood-engraving, and it is on this treatise that his scientific reputation will mainly rest. The practical value of his work has been vast, and his book today is as valuable as when it was first written, more than fifty years ago.

Fig. 137. Thaddeus William Harris.

Hart, Edmund Hall. By *E. S. Hubbard.*

Edmund Hall Hart, horticulturist, was born December 26, 1839, at Heartsease, Manchester Bridge, near Poughkeepsie, New York. He died April 22, 1898. He married Isabella Martense Howland, December 1, 1870, and was survived by his wife and three daughters. His father, Benjamin Hall Hart, was a well-known horticulturist. Edmund got a thorough, practical, horticultural training, and with his brothers, Walter and Ambrose, settled, in 1867, in the then wilderness, at Federal Point, Florida. Here they engaged in the growing and culture of oranges and other citrus fruits. This was the experimental stage of citrus-culture in Florida, and Edmund H. Hart made a life-long study of varieties and their improvement. At one time he had over one hundred and fifty varieties under culture and observation. Mr. Hart is best known for having introduced Hart's Late or Tardiff orange, now known in California as Valencia Late. He was largely instrumental in standardizing the best market varieties. He introduced Hart's Choice banana. He experimented with all fruits that promised success in this climate. He gave special attention to testing palms and ornamental shrubs, and was considered the best authority on palms in Florida. He imported seeds of rare palms listed in seed catalogues of this country and Europe. His grounds contained probably the largest and finest specimens in Florida of *Phœnix sylvestris* and *P. canariensis*, *Latania Borbonica*, *Cocos Australis*, *Chamærops excelsa*, and numerous other varieties that proved hardy.

Mr. Hart was a charter member of the Florida Horticultural Society, and an extensive exhibitor at fairs and exhibitions. His financial success was uniform and marked. Modest and retiring in manner, his few remaining contemporaries remember him best by his writings for the press. He was possessed of considerable literary ability. He contributed the sub-tropical section to Thomas' Fruit Culture. His influence broadened and elevated Florida horticulture.

Hatch, William Henry. See page 426.

Henderson, Peter. By *Byron D. Halsted.*

Peter Henderson, gardener, merchant, author, was born in Pathhead, near Edinburgh, Scotland, June 9, 1822. He died of pneumonia at his home in Jersey City, January 17, 1890. From his father, a land-steward, was inherited a splendid physique, with which was harmoniously blended great intellectual gifts, coming more particularly from his maternal ancestry.

Educated in the parish school, at sixteen, already proficient in book-learning and a keen observer, he was apprenticed in the gardens of Melville Castle and soon became an enthusiastic student of plants, early winning prizes for his accomplishments. In his twenty-first year, he came to America "with but three sovereigns in his pocket," but abounding in pluck and industry, and served as gardener first under George Thorburn at Astoria, N. Y., then with Robert Buist at Philadelphia, and later with C. F. Spang, of Pittsburg. In 1847, with an accumulated capital of $500 he entered into partnership with his brother James in the market-garden business in Jersey City. Soon was begun the cultivation of ornamental plants, which rapidly developed into a great enterprise. By dint of long days and years of prodigious labor, combined with keen insight, he became a master of his art. A leading partner in the seedhouse of Henderson and Fleming, in Nassau street, New York City, he became, in 1871, the head of the business (Everything for the Garden) so widely and well known by the name of Peter Henderson & Co. His familiarity with the obstacles to be overcome by practical crop-growers, and his deep sympathy for the artisan, led to the preparation, in 1866, of his first book, Gardening for Profit, the success of which has been phenomenal. It had a deep and lasting influence on truck-growing. Two years later, Practical Floriculture followed, it being a guide for esthetic gardening; and in 1875 appeared Gardening for Pleasure, the contents of which are so admirably expressed in the title. The many editions and frequent revisions of these three works testify to their general acceptance by an appreciative public. The reader of these lines must bear in mind that Mr. Henderson wrought in a generation that is now past, and without the aid of the land-grant college and the experiment station to train horticulturists for work and provide for the substantial growth of the science of crop-growing, through many well-equipped centers of research. His was the work of the pioneer, and his books were as blazed trees through the deep-tangled forests of ignorance. Other volumes from the same versatile pen are: Garden and Farm Topics (1884); Handbook of Plants (1881–1890), a new edition of which he was re-writing when stricken with his fatal disease. In conjunction with William Crozier, he produced How the Farm Pays. Some of Mr. Henderson's most potent papers were presented before various horticultural and floricultural societies, of which space here will permit of but a single title, namely, "Popular Errors and Scientific Dogmas in Horticulture."

Peter Henderson's life is a brilliant illustration of the great success that is to be achieved by those who preserve their liberal endowments of health—he was scarcely ill a day in his long and busy life—by the strictest temperance, in the full measure of that much misused word; and mix their large sagacity with strict fidelity to the highest ideals, tempering all with true human kindness clothed in charming humanity.

Hepburn, David.

David Hepburn was joint author with John Gardiner of the second American book on horticulture, published at Washington, D. C., in 1804. [See note in Cyclopedia of American Horticulture, page 730.]

Hickman, John Fremont. By *C. E. Thorne.*

John Fremont Hickman, agricultural investigator, was born July 3, 1856, near East Liverpool, Ohio. He died from typhoid fever, October 22, 1902. He was graduated from the Pennsylvania State College in 1880, afterward pursuing post-graduate work. He was superintendent of the eastern experimental farm of that college from 1881 to 1883, when he returned to his home because of his father's failing health. On the reorganization of the Ohio Agricultural Experiment Station under the Hatch Act, in April, 1888, he was appointed agriculturist of the station, an appointment which the death of his father had left him free to accept. This position he held until his untimely death.

In 1894, he was married to Bertha E. Wildman, who, with two children, survives him.

Mr. Hickman's chief work for agriculture was accomplished through his connection with the Ohio Agricultural Experiment Station. In the prosecution of scientific research the strictest honesty is absolutely indispensable, and this quality Mr. Hickman possessed. He was careful and accurate in his methods, and through his supervision of the field experiments of the station he contributed largely to the establishment of this method of research on a thoroughly scientific basis. He was a ready, forceful and entertaining public speaker, not given to exaggeration, but having the ability to clothe his arguments in convincing language; and thus he secured and held the confidence of the farmers of the state, whom he frequently addressed at farmers' institutes and similar gatherings. His life was that of a conscientious, careful, conservative seeker after truth, not only in the field of scientific research, but also in spiritual matters. He was a member of the Presbyterian church, in which he occupied important positions.

Hinsdale, Roldon O. By *C. E. Thorne.*

Roldon O. Hinsdale, farmer, legislator, was born March 27, 1840, on a farm near Wadsworth, Medina county, Ohio. He died on a neighboring farm August 25, 1906. Mr. Hinsdale was educated in the district schools of his neighborhood and in the Eclectic Institute of Hiram, Ohio, now Hiram College, where he was a pupil of James A. Garfield. In 1869, he married Maria Chamberlain of Solon, Ohio, who survives him. Born of the sturdy New England stock which settled the Western Reserve, he became not only a thoroughgoing farmer but a public-spirited citizen, leading in every progressive movement in his neighborhood. After serving in almost every local office, he was elected in 1895 to represent his county in the state legislature, where he served as chairman of the Committee on Agriculture. In 1903, he was elected member of the State Board of Agriculture, in which capacity he gave special attention to the improvement of agricultural machinery, for which service he was exceptionally well qualified.

In boyhood, Mr. Hinsdale became a member of the church of the Disciples of Christ, which his parents had joined when its doctrines were first preached in that section, and of which he remained through life a faithful and consistent supporter.

Mr. Hinsdale's work for agriculture consisted, first, in the influence which an intelligent, thinking farmer always exerts on those around him, and next in the opportunities which his public life gave him to work for the interests of agriculture in legislation and in the management of the state's great agricultural society. He was a conspicuous example of the uplifting force which an earnest, thoughtful farmer may exert on his calling.

Holmes, Ezekiel. See pages 365, 366.

Holmes, John Clough. See page 403.

Hoskins, Thomas H. By *F. A. Waugh.*

Dr. Thomas H. Hoskins, physician, horticulturist, writer, was born at Gardiner, Maine, in 1828. He died in Newport, Vt., in 1895. At the age of twenty-one years, he went to Louisville, Ky., and entered the drug business. He studied medicine at Louisville University and practiced there for a time. When the war broke out in 1861, he returned to New England and took up the practice of medicine in Boston. In 1866, because of failing health, he was obliged to leave Boston and sought a new home in Newport, Vt., where he lived until his death in 1895.

The name of Dr. Hoskins is associated in horticulture with the introduction of the Russian fruits. He was a contemporary of Dr. Gibb and Prof. J. L. Budd, with whom he maintained a lively correspondence. His orchard at Newport, Vt., was situated on the highland of the Green mountain range, about five or six miles from the Canada line, in a cold, bleak, exposed situation. It thus became a natural and proper testing ground for the ironclad varieties so enthusiastically sought by the pioneers of our northern states and territories.

Dr. Hoskins was well known as a contributor to all the leading horticultural papers. He was a bright and incisive writer, and very able in making his opinion known. As a young man he did editorial work on the Boston Courier. In 1870, he started the Vermont Farmer, of which he was managing editor for many years. At a later time, he was, for twenty years, the agricultural editor of the Vermont Watchman. While these papers had a comparatively local circulation, Dr. Hoskins' strong personality and unusual ability as a writer made them very effective in northern Vermont. The principal service of a strictly horticultural nature rendered by Dr. Hoskins, aside from the testing of hardy fruits, was the introduction of the Scott winter apple and the dissemination of the Yellow Transparent.

Hovey, Charles Mason.

Charles Mason Hovey, horticultural journalist and nurseryman, was born in Cambridge, Mass., October 26, 1810. He died there September 2, 1887. He is best known as editor of the Magazine of Horticulture, 1835–68. It was founded as the American Gardener's Magazine, by C. M. Hovey and his brother Phineas Brown Hovey. Mr. Hovey was author of Fruits of America, issued in parts from 1852 to 1856. His greatest contribution to horticultural varieties was the Hovey strawberry, first fruited in 1836, which is generally regarded as the starting-point of American commercial strawberry-growing. He was an active member and president of the Massachusetts Horticultural Society. [Biography and picture in Cyclopedia of American Horticulture, pages 777, 778.]

Hubbard, Henry Guernsey. By *L. O. Howard.*

Henry Guernsey Hubbard, entomologist, horticulturist, was born at Detroit, Mich., May 6, 1850. He died of tuberculosis, January 8, 1899. His father, Bela P. Hubbard, a prominent citizen of Detroit, was a man of strong scientific tendencies, and was deeply interested in botany, forestry, arboriculture and archæology. As a boy, Henry Hubbard was well acquainted with the life habits of the birds, mammals and other wild creatures about Detroit. He was educated at a private school in Cambridge, Mass., and for several years under private tutors in Europe. He was graduated from Harvard University in 1873. By association at Harvard with Hagen, Osten Sacken, Schwarz and Crotch, his attention was fixed on the subject of entomology. In 1874, he started a private museum in Detroit, and with Schwarz began the formation of a great collection of Coleoptera. With Schwarz, he made several expeditions, and in 1879 accepted the position of Naturalist to the Geological Survey of Kentucky. In the same year, he settled at Crescent City, Florida, and built up a semi-tropical garden which afterward became famous, In 1880, he was made an agent of the United States Entomological Commission, and later of the Department of Agriculture. His investigations of the cotton insects in 1880 were very valuable. In 1881, he commenced an investigation of the insects affecting the orange, in the course of which he developed a practical kerosene-soap emulsion, now known as the Riley-Hubbard emulsion. His work on orange insects was carried to a most successful conclusion, and his report on this subject, published as a special volume of the Department of Agriculture in 1885, is founded entirely on original observations. The work remained standard for many years, and is one of the most careful considerations of the insects of a given crop ever published. After the conclusion of this volume, he devoted almost all of his time to advanced horticulture for several years. In 1894, he again became connected with the Department of Agriculture as a special agent, and began the revised edition of his work on orange insects, but died before he had completed it. Mr. Hubbard's fame as an economic entomologist depends largely on his work on orange insects and on his kerosene-soap emulsion formula. As a keen observer of insect life and as an ingenious and philosophical worker, he earned a unique rank among the natural-history workers of the United States. His investigations of the fauna of the Mammoth Cave, his studies of the Ambrosia beetles, his work on the insect guests of the Florida land tortoise, and that on the insect fauna of the giant cactus, are striking instances of the great biological value of the lengthy series of studies which he made in the course of his comparatively short life.

Humphreys, David. By *William H. Brewer.*

David Humphreys, soldier, statesman, author, poet, introducer of Merino sheep, was born July 10, 1752, in Derby, Conn. He died February 21, 1818, at New Haven, Conn. After completing his schooling, he joined the army of the Revolution, on the staff of General Putnam. In 1780, he became a colonel and aide-de-camp to General Washington, with whom he served till the close of the war. He was with General Washington for a year at Mount Vernon, after the close of the war. In 1786, he was elected to the legislature of Connecticut. In 1791, he was appointed Minister to Portugal, at which time he was married. He was transferred to the Court of Algiers in 1793, and to Spain in 1796, where he remained until 1802. In the War of 1812, he commanded two Connecticut regiments. He acquired considerable fame as a writer, especially of poetry, and a collection of his writings was published in New York in 1804. He also published a Life of General Putnam.

David Humphreys' special service to agriculture lies in his having been the first to introduce to America a flock of Merino sheep and establish them here for the production of wool, and to start the manufacture of fine woolens. In 1801, he secured a flock of about twenty-five rams and seventy-five ewes in Spain, drove them into Portugal, and, with Spanish shepherds, shipped them from Lisbon to a farm in the Naugatuck valley, Connecticut. Here he established a woolen mill, and made the first broadcloth in America. He sold Merinos from his flock to other sheep-breeders for grading the wool.

Mr. Humphreys was also active in the early Society for the Promotion of Agriculture in Connecticut. Some of his agricultural addresses were published. [Adapted, in part, from Herringshaw's Encyclopedia of American Biography.]

Hunnicutt, James Benjamin.
By *G. F. Hunnicutt.*

James Benjamin Hunnicutt, farmer, teacher, editor, was born May 16, 1836, in Coweta county, Ga. He died in Atlanta, Ga., December 17, 1904. He was educated at Emory College, graduating with first honor in the class of 1859. He then entered school-teaching and farming. He soon began merchandising. During the twenty years he had a store, he never gave up farming, but on the contrary gave increasing attention to it. He was chosen Assistant Commissioner of Agriculture in 1880. The following year he was elected Professor of Agriculture at the University of Georgia, where he remained seven years. For many years he was a local Methodist preacher, in addition to his other duties.

In March, 1899, Mr. Hunnicutt moved to Atlanta and purchased The Southern Cultivator, which he edited with singular ability until the time of his death. He was one of the first to advocate the teaching of agriculture in common schools, and his able advocacy had much to do with bringing the public mind up to the point of having it put in the course of study in his state. In 1903, he published a book entitled Agriculture for the Common Schools, which was adopted by the state of Georgia and later by the state of South Carolina.

Through his eventful life he was a farmer at heart and in practice. Being a student, he posted himself on all scientific literature pertaining to farming. He constantly tried new methods and improved machinery. He practiced in his farm operations whatever he advocated.

Husmann, George.

George Husmann, horticulturist and viticulturist, was born November 4, 1827, at Meyenberg, near Bremen, Germany. He died November 5, 1902, at Napa, Cal. When eight years old he received six months training at his father's school before his family emigrated to the United States. This schooling and some private lessons given him by his brother Frederick was all the instruction he received. During the gold excitement, he went to California. In 1851, he settled in Hermann, Gasconade county, Mo., on the estate of his sister; and here his horticultural career began. Here he established the second oldest factory in this country for turning American grapes into wine. In 1858, the firm of Husmann & Manwaring was organized. On January 18, 1862, he was commissioned first lieutenant and quartermaster of the Fourth Regiment of Volunteers. He served for one year. On his return home, he conducted an extensive nursery and fruit-farm. In 1866, he was chosen one of the Electors-at-Large for President and Vice-President of the United States. He was president of the Bluffton Wine Company. In 1870, he was appointed a member of the Board of Curators of the Missouri State University. He was a charter member of Missouri Horticultural Society and of the State Board of Agriculture. In 1872, he established the Husmann Nurseries at Sedalia, Mo., which he conducted until 1878, when he was appointed Professor of Pomology and Forestry of the State University of Missouri. In 1878, with Parker Earle, he organized the Mississippi Horticultural Society. 1881, he resigned his professorship and became manager of the J. W. Simonton Estate, the Talcoa Vineyards, in Napa county, California. Four years later he was appointed State Statistical Agent for California.

In 1866, Mr. Husmann's first book appeared, Grapes and Wine. About 1869, he began the publication of the Grape Culturist, a journal which was continued for four years. In 1880, he published his Grape Growing and Wine Making. In 1888, appeared his Grape Culture and Wine Making. Aside from these books, he was a constant contributor to horticultural and viticultural journals.

Mr. Husmann was married on July 13, 1854, to Miss Louisa Carolina Kielmann, at Hermann, Gasconade county, Mo. Ten children were born to them.

Hussey, Obed.

Obed Hussey, inventor, was born in Nantucket in 1800. He was killed in a railroad accident in 1860, at Baltimore, Md. His first invention was a machine to make pins. Soon after, while living in Cincinnati, he undertook the construction of a machine to mold candles. His special claim to attention lies in his reaping-machine, which he patented on December 31, 1833, and which, with the McCormick reaper, has stood as the model for all subsequent successful machines. In 1858, he invented a steam-plow.

Ingersoll, Charles Lee.

Charles Lee Ingersoll, educator, was born November 1, 1844, at Perry, N. Y. He died at Grand Junction, Colo., on the eighth of December, 1895. He studied in the district schools of Perry and Orangeville, until 1855, when his parents removed to a farm in Commerce, Mich. Here he attended school in the winter time, later teaching. He enlisted in the Ninth Michigan Cavalry and served through the war. On his return home he again undertook teaching. In 1872, he entered the Michigan Agricultural College, and secured his B.S. degree in 1874. He continued in post-graduate work in the college, specializing in agriculture and chemistry, getting his Master's degree in 1877. On the completion of his advanced work he was made professor of agriculture. In 1879, he removed to Lafayette, Ind., to become professor of agriculture and horticulture in Purdue University. In 1882, he became president of the Colorado State Agricultural College at Fort Collins. In 1888, when the agricultural experiment station was founded, he became director. His work in building up the college and station, and establishing them on a permanent working basis, is deserving of special credit, as he took hold of the institution when it was in a destitute and almost hopeless condition.

Johnson, Willis Grant. (Fig. 138.)

By *Mrs. Fannie P. Johnson.*

Willis Grant Johnson, teacher, state entomologist, editor, was born July 4, 1866, at New Albany, Ohio. He died March 11, 1908, in New York city. The first eighteen years of his life were spent on the farm. Aside from the common school education, he was specially trained for his life work at the Ohio Agricultural College and the New York State

Fig. 138. Willis Grant Johnson.

College of Agriculture at Cornell University. After leaving Cornell, he entered Leland-Stanford University, where he made special investigations in agriculture and horticulture in the Pacific Coast states. In 1892, he married Fannie Helena Phillips, of Ithaca, New York, who survives him. There are two children.

Mr. Johnson became a teacher of agriculture, holding positions in Leland-Stanford University and the University of Illinois, where, in addition to his teaching, he was detailed to make special investigations in every county of the state. Under Governor Lowndes' administration in Maryland, he was made State Entomologist. His work in this capacity attracted attention at home and abroad, and delegates from Germany, Holland, England and Canada were sent to study his methods. For his scientific work he was awarded a gold medal by the Paris Exposition. In addition to his entomological duties, he established the State Horticultural Department of Maryland, of which he was chief until called to the editorship of the American Agriculturist, which position he filled very efficiently until his death. Throughout his life he was a careful student of agriculture, and had special opportunity to study the farming conditions in the greater part of the United States and Canada. He was a member of the American Association of Agricultural Colleges and Experiment Stations, the Society for the Promotion of Agricultural Science, the American Pomological Society, Fellow of the American Association for the Advancement of Science, American Association of Economic Entomologists, Washington Biological Society, American Canners' and Packers' Association, Order of Patrons of Husbandry. In 1907, he was appointed by Governor Hughes trustee of the New York State Agricultural Experiment Station at Geneva. He was active in securing the appropriation for establishing the New York State College of Agriculture at Cornell University, approved in May, 1904.

As an author on practical popular subjects, Professor Johnson was well known. His writings emphasized the practical side of farming.

Judd, Orange. (Fig. 139.) By *James S. Judd.*

Orange Judd, editor and publisher, was born July 26, 1822. He died December 27, 1892. When he went to New York, in 1853, to take practical charge of the American Agriculturist, at that time published by the Allens, it was a struggling sheet, of value editorially but of slight worth as a business proposition. Mr. Judd saw possibilities for the future, and in three years bought the paper. His early farm training in western New York, his originality and his industry, were reflected in his paper. He believed not only in making a paper editorially of absolute value, but in bringing its methods before the public through liberal advertising. A still further characteristic was the absolutely high principle which controlled both the editorial and the advertising policies. Orange Judd looked on his readers as not only his friends, but practically as constituting one large family, and he considered it his duty to admit nothing to the columns of his paper which he would not read and recommend to the members of his immediate family. He was aggressive in explaining to his readers everything which he thought was injurious or in any way a swindle on the public.

As a writer, Mr. Judd's productions were clear and concise, and particularly so his popular articles on scientific subjects. As a publisher, as an example of his enterprise is his gathering in 1857–8, in Europe, all of the obtainable sorghum seed, which was distributed to at least 40,000 persons, and which stimulated the sorghum industry in this country. At one time he distributed over 3,000,000 packages of flower seeds. At other times he had exhibits of flowers, strawberries, fruit, pumpkins, corn, bread, patching and darning—all of which were sent in by readers of the American Agriculturist, and which were sources of great interest to its readers and to the thousands who witnessed the exhibits in New York. In 1885, he was editor and manager of the Prairie Farmer, of Chicago. In 1888, with his sons he purchased the Farmer at St. Paul, Minn., moved it to Chicago and renamed it the Orange Judd Farmer.

Fig. 139. Orange Judd.

Though indefatigable in his journalistic work, his intense activity and catholic spirit led him into various charitable and eleemosynary fields. Among these may be mentioned the United States Christian Commission, during the war; railroad building; the erection of block after block of houses at his home city (Flushing), with the idea of securing homes with modern convenience at low prices, and publishing the plans, after completion, in the American Agriculturist. The first agricultural experiment station in this country was established in Middletown, Conn., partly as a result of his earnest efforts and arguments in the Connecticut legislature in 1875. His large financial contributions to Sunday-school missions and church work generally, were more than liberal. His most marked gift was to his alma mater, Wesleyan University of Middletown, of the Orange Judd Hall of Natural Science, which he erected at an expense of $100,000.

Kearney, Theodore. (Fig. 140.)
By *Frederic T. Bioletti.*

Theodore Kearney is said to have been born in England, of Irish parents, about sixty years ago, and to have claimed American citizenship by virtue of the naturalization of his father. He died May, 1906, on board an Atlantic liner, bound for Europe, whither he was going because of ill-health. He came to California when he was a youth. The first ten or fifteen years of his life in California were spent in San Francisco, in clerical positions, and about 1873 or 1874 he went to Fresno. For several years, he was engaged in buying and selling land as an agent of W. S. Chapman and of the Bank of California.

Mr. Kearney purchased the Fruitvale estate of about five thousand acres, ten miles west of Fresno. An irrigation system was installed, and about twelve hundred acres were sold to settlers, to be paid for in instalments, and under contract to improve and plant vines. The famous Kearney avenue, a boulevard extending from the city of Fresno eleven miles west and bordered with rows of palms, eucalyptus and flowering shrubs, was established. This boulevard he finally donated to the county. During the panic of 1893, the settlers were unable to meet the instalments, and the whole estate finally reverted to Mr. Kearney, who increased the vineyard to 1,500 acres and set out large fields of alfalfa. He laid out a beautiful park at the western end of the boulevard, and projected a large mansion to be called Château Fresno. This project was never accomplished.

In 1898, the California Raisin Growers' Association was organized, principally through the exertions of Mr. Kearney, who remained its president almost constantly until its breaking up in 1906. This association has been one of the most potent factors in raising the price of raisins and making the business profitable to the growers.

Fig. 140. Theodore Kearney.

Mr. Kearney's principal services to agriculture in the state of California are the prominent part he took in developing the resources of Fresno county, planting and encouraging others to plant the thousands of acres of Muscat of Alexandria grapes for raisins, and his donation to the state, in trust for the University of California for the establishment of an agricultural college and experiment farm, of the magnificent Kearney estate valued at about three-quarters of a million dollars, and yielding at the time of his death a net income of about sixty thousand dollars annually. According to the terms of the will, this estate was to be used for the establishment of "The Kearney Experimental Station as an adjunct of the College of Agriculture of the University of California." The will gives no directions as to details of the establishment contemplated, but, in a document of eleven type-written pages, Mr. Kearney left his views on the matter. This document shows that he had long contemplated this disposition of his property, and had given it mature thought.

Fig. 141. Robert Clark Kedzie.

Kedzie, Robert Clark. (Fig. 141.)
By *Frank S. Kedzie.*

Robert Clark Kedzie, physician, chemist, teacher, was born at Delhi, N. Y., January 28, 1823. He died at Lansing, Mich., November 9, 1902. He was graduated from Oberlin College, in 1847, and from the Medical Department of the University of Michigan in 1851.

After ten years of active medical practice, on his fortieth birthday, Dr. Kedzie was elected Professor of Chemistry in the Michigan State Agricultural College, and there continued uninterruptedly to work for over thirty-nine years. His work naturally divides itself into two types, that of teacher and that of experimenter. His literary ability and training enabled him to clothe the facts of his science in terse and elegant language. His lectures were regarded as models of style. He was able in a preëminent degree to impress his earnestness of spirit on his students. As an experimenter, he was able and original, but he was drawn only to investigate and experiment where the result would be likely to shed light on problems of practical interest to the farmer or fruit-grower. Among his experiments might be mentioned a study of wheat to determine the quality best suited for Michigan conditions. This investigation was suggested by the attitude taken by an association of Michigan millers to discourage the sowing of Clawson wheat by the farmers, because it was incapable of furnishing a good flour, while it was a variety giving extraordinary yields. Dr. Kedzie's investigation showed that the wheat, aside from being adapted to Michigan conditions, was capable of furnishing a first-class flour. From 1888 to 1894, he experimented extensively, to ascertain whether Michigan was adapted to the growing of sugar-beets. Beets were grown in all the principal localities and under the various conditions of climate obtaining in the state. The sugar-beet was established in Michigan as a result of his work. The first factory was opened at Bay City in 1898, and Michigan has since remained one of the important sugar-producing states.

The Farmers' Institute was inaugurated in Michigan in 1876, on Dr. Kedzie's initiative. At the early institutes, Dr. Kedzie was brought into contact with many practical problems, and some of these encounters lead to investigations in his laboratory involving a great deal of hard work. In 1885, he secured the passage of a law providing for the inspection and analysis of commercial fertilizers, superintended its enforcement, and succeeded in driving many spurious and worthless brands from the market.

As President of the State Board of Health, 1873-80, he investigated subjects of dangerous illuminating oils, ventilation of school buildings, municipal water-supply, and poisonous wall-paper. He also assisted in securing the passage of the act establishing a State Food and Dairy Commission, and was the first appointed State Analyst. Toward the close of Dr. Kedzie's work, its value was recognized by the conferring of two honorary degrees, Doctor of Science from the college in which he had so long labored, and Doctor of Laws from the University of Michigan.

Kenrick, William.

William Kenrick, horticulturist and writer, was born in 1795. He died in February, 1872. In 1835, he published The American Silk Grower's Guide. In 1833, he issued the New American Orchardist. [Biographical sketch in Cyclopedia of American Horticulture, page 856.]

Kirtland, Jared Potter. (Fig. 142.)
By *W. J. Green.*

Dr. Jared Potter Kirtland, physician, legislator, teacher, horticulturist, was born in Wallingford, Conn., November 10, 1793. He died in Cleveland, Ohio, December 10, 1877. He was graduated at the Yale Medical School in 1815, and, after practicing medicine for several years in Wallingford and Durham, Conn., removed to Poland, Ohio, where he continued his practice. He served three terms in the Ohio legislature between 1829 and 1835, and from 1837 to 1842 was professor of the theory and practice of medicine in the Ohio Medical College at Cincinnati, afterward filling similar positions at Willoughby and in the medical department of Western Reserve University. He was assistant in the first geological survey of Ohio, and made a report on its zoölogy. About 1840, he removed to Rockport, just west of Cleveland. In 1845, he was one of the founders of the Cleveland Academy of Science, which became the Kirtland Society of Natural History, and to which he left his large collections.

Fig. 142. Dr. Jared Potter Kirtland.

From his boyhood, Dr. Kirtland was an enthusiastic naturalist and horticulturist. At sixteen years of age he attempted the production of new varieties of fruit by cross-fertilization, a work which he continued through life. He made valuable additions to our knowledge of the honey-bee and of the silkworm, and other important contributions to natural science. He gave most of his attention to the crossing of cherries, of which he left several valuable varieties, and to peonies and other flowering plants. He lived at a time when the discussions at horticultural meetings were devoted largely to points in nomenclature and characteristics of varieties of fruits, but his own horticultural work had more to do with scientific questions. He was a frequent contributor to horticultural journals, and exerted a wide influence, especially in elevating horticulture from empirical grounds and placing it on a higher plane.

Klippart, John Hancock. By *Josephine Klippart.*

John Hancock Klippart, for nearly twenty-two years Secretary of the Ohio State Board of Agriculture, was born in Stark county, Ohio, July 26, 1823. He died in Columbus, Ohio, of paralysis of the throat, October 24, 1878. His parents were Henry and Eve (Henning) Klippart. In early life, he attended the "subscription" schools, taught by Irish schoolmasters. Afterward he was employed in a drug store. In 1847, he married Emeline Rahn of Canton, Ohio, by whom he had two daughters. In the same year, he opened a general supply store of his own, and was profitably engaged in it until 1853. In 1849, he was appointed postmaster of Osnaburg, Stark county, and also, in the meantime, was engaged as a sub-contractor on the line of the Ohio & Pennsylvania Railroad. In 1853, he became associated editorially with the Democratic Transcript at Canton, and the following year, in Cleveland, with the Ohio Farmer, which latter relationship he retained until December, 1856, when he became a successful candidate for Corresponding Secretary of the Ohio State Board of Agriculture, an office which he occupied up to the time of his death. For many years he was a contributor to the agricultural press. In 1860, he published an exhaustive treatise on the Wheat Plant. Two years later, he completed The Theory and Practice of Farm Drainage. At the time of his death he had in preparation a book on corn.

In 1860, Mr. Klippart was appointed one of the commissioners to visit Massachusetts and examine into and report on the pleuro-pneumonia of cattle, which was then creating consternation among the stockmen of the country. His report was printed in the Ohio Agricultural Report for 1859. During the war, he was frequently dispatched by Governors Tod and Brough, with important messages for the armies from Ohio. In 1865, he was deputed by the Department of Agriculture at Washington, and the Ohio State Board of Agriculture, to examine the European institutions for teaching theoretical and practical agriculture, as well as to observe the systems of agriculture practiced in Great Britain and the countries of continental Europe. His report of his tour of observation was printed in the Ohio Agricultural Report for 1865. In 1869, Governor Hayes appointed him Assistant State Geologist, and he was assigned to the agricultural part of the survey. In 1873, Governor Noyes appointed him one of three Commissioners of Fisheries, assigning to him the duty of ascertaining the feasibility of replenishing the streams of Ohio and Lake Erie with fish of species adapted to these waters. To him, Ohio is more largely indebted than to any other man for the very general interest now felt in stocking the lakes and streams with food-fish.

As a student, nothing seemed to appal Dr. Klippart. His research was extensive, and his retentive faculties remarkable. He read several foreign languages. He was an indefatigable worker, practically and in the pursuit of book-learning; was a deep thinker, and a ready, concise writer. He was an excellent geologist. He applied an extensive practical knowledge of botany in many of his writings, and was well versed in anthropology and archæology. His writings are quoted in many European publications, and his book on the Wheat Plant has been reprinted abroad. He was honored by election as a member of the Central Acclimatization Society of Prussia, and the Imperial Agricultural Society of France. The California Natural History Society elected him a corresponding member, as did also the Cincinnati Natural History Society. In 1856, he was Secretary of the Cleveland Academy of Science, and subsequently was enrolled a member of the American Association for the Advancement of Science.

Landreth, David.

David Landreth, founder of the oldest seedhouse in America, was born in 1752, at Haggerston, Northumberland county, England. His son, David, was born in Philadelphia, in 1802, and died in 1880. In 1826, the younger David Landreth succeeded his father as proprietor of the well-established and thriving business in Philadelphia. He was one of the founders, a vice-president, and corresponding secretary of the Philadelphia Horticultural Society; president of the Philadelphia Society for the Promotion of Agriculture; vice-president of the United States Agricultural Society. He began the publication, in 1832, of the Illustrated Floral Magazine. He edited an American edition of Johnson's A Dictionary of Modern Gardening, published at Philadelphia in 1847. [See biographical sketch in Cyclopedia of American Horticulture, page 875.]

Langstroth, Lorenzo Loraine. (Fig. 143.)

By *A. J. Cook.*

Lorenzo Loraine Langstroth, teacher, apiarist, minister of the gospel, was born in Philadelphia, Pa., December 25, 1810. He died in the pulpit at Dayton, Ohio, Sunday, October 6, 1895. He was graduated from Yale College at the age of twenty-one, and immediately took a course in theology. He was a tutor in his Alma Mater from 1834 to 1836, and was later a successful teacher in academies at Andover and Greenfield, Mass., and at Oxford, Ohio. For two years, he was the much-loved pastor of the Congregational Church at Andover, and was forced because of ill health to resign this pastorate.

Fig. 143. Lorenzo Loraine Langstroth.

Langstroth procured his first bees in 1838. His inventive genius saw the need of a hive that would permit inspection of every part. He studied Huber's work and procured the treatise by Bevan. He used Huber's leaf hive, and was familiar with the bar or slat hive. His own great invention, the movable-frame hive, was perfected October 5, 1852. The combs were built in a frame that hung in the hive, and permitted quick and easy inspection of every part. This device was so carefully wrought and so well-planned that today it is hardly improved, even in its details, and is the favorite of nearly all of our most successful and prosperous bee-keepers.

In 1853, Mr. Langstroth published his book, The Hive and Honey-Bee. This is indeed a classic. In amount of information given, literary style and perspicuity, it left nothing to be desired. Even today, the acumen that sought out so many of the obscure facts of scientific and practical apiculture, and reached so far ahead of the time, causes wonder.

Mr. Langstroth suffered from early manhood from a severe brain affection. Often for months, and occasionally for years, he could neither read nor talk of things that otherwise would have greatly interested him. Despite this impediment, he accomplished a great deal. In 1836, he was married to Miss Anna M. Tucker, who died in January, 1873. A son and two daughters were born to them. Mr. Langstroth had a fine physique, a genial and kindly manner, and a keen, intellectual expression, that made him fascinating as a companion and a friend. He was not only great in invention and research, but as a writer was master of a superior diction; as a preacher, he was eloquent and persuasive; as a man, he was greatly beloved. [See Vol. III, p. 278.]

Lawrence, William.

William Lawrence, lawyer, statesman, soldier, wool-grower, was born in Jefferson county, Ohio, in 1819. He died at Kenton, Ohio, May 8, 1899. He was graduated from Franklin college in 1838. He studied law, and was admitted to the bar on attaining his majority. From 1856 to 1861, he was judge of the court of common pleas in the third judicial district, and was reporter of the supreme court of Ohio for twelve years. He commanded the Eighty-fourth Ohio Volunteer Infantry in the Civil war. He was first comptroller of the treasury from 1880 to 1885, and inaugurated the system of publishing the decisions of the department for reference. He was the author of several works, among them the Law of Religious Societies and Church Corporations, and the Life and Public Services of John Sherman. In 1864, he was elected to the Thirty-ninth Congress, and, with the exception of the Forty-second Congress, he served steadily from that time through the Forty-fourth. He succeeded, in Congress, in securing the public lands to actual settlers; that Indian treaty sales of these lands should be prohibited, as they were by act of March 3, 1871, thus breaking up one of the most gigantic agencies for squandering the public lands and creating monopolies. On July 7, 1876, he carried through the "Lawrence Bill," requiring the Pacific Railroad companies to indemnify the government against liability and loss, because of the government loan of credit to the companies, as estimated, of $150,000,000.

Mr. Lawrence was deeply interested in the production of wool and of its kindred interests, and was himself a large wool-producer. In 1887, he served as a delegate to the national convention of wool-growers in St. Louis, and again in Washington, D. C., in 1888 and 1889; and in January, 1891, he was elected president of the Ohio Wool Growers' Association, in which position he was continued by re-elections up to the time of his death. In October, 1893, he was elected president of the National Wool Growers' Association, and was serving in that capacity at the time of his death. He was considered the best-informed authority on the wool question in the country. [Adapted largely from Ohio in Congress, by Wm. A. Taylor.]

Lewis, Harris. By *H. H. Wing.*

Harris Lewis, dairyman, was born September 5, 1816. He died October 26, 1887. He was a progressive farmer in New York State during the development of the factory system of butter- and cheese-making. He lived nearly his entire life in Herkimer county, N. Y., and was a practical dairyman. Although the honor of originating coöperative dairying under the so-called factory system belongs to Mr. Jesse Williams, still, had it not been for the cordial coöperation of Mr. Lewis and a few other progressive dairymen, the system would not have developed nearly so rapidly nor so successfully as it did.

Linsley, Daniel Chipman.
By *Mrs. Mary L. Tilden.*

Daniel Chipman Linsley, farmer, editor, was born April 17, 1827. He died October 7, 1889, in Burlington, Vt. He was the son of Charles and Sarah Chipman Linsley. His father owned a farm in Middlebury, Vt., and early in life he became much interested in agriculture, especially in stock-breeding. He raised fine horses, for which he received high prices. In 1857, he wrote a book on Morgan Horses, which had an extensive sale. On January 1, 1859, he began to edit the American Stock Journal, published monthly at 25 Park Row, New York City. The paper was devoted exclusively to the interests of breeders.

Lintner, Joseph Albert.

Joseph Albert Lintner, scientist, entomologist of the state of New York, was born in Schoharie, N. Y., February 8, 1822. He died May 5, 1898. He was graduated from Schoharie Academy in 1837. He then went to New York and engaged in the mercantile business. In 1848 he returned to Schoharie, and began the study of entomology. On October 2, 1856, he married Frances C. Hutchinson, of Utica, N. Y., and four years later removed to Utica, where, for seven years, he was interested in the manufacture of woolen goods. In 1868, he went to Albany as Zoölogical Assistant in the New

York State Museum of Natural History. During his occupancy of this office, he continued his entomological studies, and wrote for publication on the subject. In 1880, Governor Cornell appointed him state entomologist. He was a voluminous writer on entomological subjects, and his writings were widely accepted. For two years he was president of the Entomological Club of the American Association for the Advancement of Science; was president of the Association of Economic entomologists; president of the Department of Natural Science of the Albany Institute; on the scientific staff of the State Museum of Natural History. He was a man of unusual intellect, yet modest and humble, ever ready to give to the inquirer out of his store of information.

Lodeman, Ernest Gustavus.

Ernest Gustavus Lodeman, horticultural investigator and writer, was born in Neufchâtel, Switzerland, May 3, 1867. He died December 2, 1896. He was originator of the spray-calendar idea. In 1896, he published The Spraying of Plants. [Biographical sketch in Cyclopedia of American Horticulture, page 937.]

Logan, Mrs. Martha.

Mrs. Martha Logan, writer, was born in Charlestown, S. C., in 1702. She died in 1779. She was the daughter of Robert Daniel, one of the last of the proprietary governors of the province. Following the example of a Mrs. Lamboll, Mrs. Logan became greatly interested in gardening, and at seventy years of age put the results of her experience into book form in The Gardener's Kalendar. This is the first known horticultural book of America.

Longworth, Nicholas.

Nicholas Longworth (1783-1863) has been called the "father of American grape-culture." From John Adlum he received the Catawba, and became the means of making grape-growing a commercial success in the Ohio Valley. He was one of the first to perceive that many strawberries are infertile with themselves, and to suggest the planting of pollenizers. He introduced the Ohio Everbearing raspberry, the first improved variety of *Rubus occidentalis*. In 1846, he published a pamphlet on The Cultivation of the Grape and Manufacture of Wine; also, Character and Habits of the Strawberry Plant. [Biographical sketch in Cyclopedia of American Horticulture, page 939.]

Loring, George Bailey. By *F. H. Fowler.*

George Bailey Loring, surgeon, legislator, writer, was born at North Andover, Mass., November 8, 1817. He died at Salem, Mass., September 14, 1891. He was graduated from Harvard College in 1838, and from the Harvard Medical School in 1842; was surgeon of a regiment of state militia in 1842–44, and of the Chelsea Marine Hospital in 1843–50, and was appointed commissioner to revise the United States Marine Hospital System in 1849. He married and removed to Salem in 1851, where he was postmaster from 1853 to 1857. While employed with these duties, he began a practical and scientific study of agriculture, established an experimental farm of 450 acres, and became widely known as a lecturer and authority on agriculture. He founded the New England Agricultural Society in 1864, and was its president until 1891; represented the Essex Agricultural Society on the State Board of Agriculture from 1860 to 1877, and served on the same Board by appointment of the governor in 1888–90, served in the Massachusetts House of Representatives in 1866–67, was president of the State Senate in 1873–76, representative in Congress in 1876–81, United States Commissioner of Agriculture in 1881–85, United States Minister to Portugal in 1889–90, and held other public offices of responsibility and trust.

Dr. Loring was particularly active in the early days of the Massachusetts Agricultural College, and while a member of the State Board of Agriculture did much to help forward the interests of the college. In 1869–72, he was lecturer on stock-farming. Besides numerous addresses, he published The Relations of Agriculture to the State in Time of War (1862); Eulogy of Louis Agassiz (1873); The Farm-Yard Club of Jotham (1876); and The Cobden Club and the American Farmer (1880).

Lyon, Theodatus Timothy. By *L. R. Taft.*

Theodatus Timothy Lyon, horticulturist, was born in Lima, N. Y., January 23, 1813. He died February 6, 1900. He removed with his family to Michigan in 1828 and settled at Plymouth. In 1848, he planted, for purposes of study and comparison, an extensive orchard of apples and pears, which included all of the sorts that he could obtain, many of them known to have little commercial value. He was a valued correspondent of Charles Downing, John A. Warder, John J. Thomas, Marshall P. Wilder, Patrick Barry, and other leaders in American pomology. Large exhibits of fruits from his trial orchards were made at the American Institute, New York City, and at meetings of the American Pomological Society. In 1876, he was elected president of the Michigan Pomological Society, which in 1880 became the Michigan State Horticultural Society, and was unanimously reelected until 1893, when, at his own request, he was released and was made honorary president for the remainder of his life. In addition to his annual addresses and technical papers, which are of unusual excellence, he prepared an extended History of Michigan Horticulture, which was printed in the annual report of the society in 1887.

Mr. Lyon was a member of the American Pomological Society and for many years was chairman of its committee on American fruits, and was in charge of the preparation of its Fruit Catalogue. Later, he became a special agent of the Division of Pomology of the United States Department of Agriculture, and in that capacity prepared a card catalogue in which was included all of the known varieties of apples. At the time of his death he was at work on a similar catalogue of pears. For ten years, beginning in 1899, he was in charge of the fruit-testing sub-station at South Haven, established by the Michigan Agricultural College. He worked for years to secure uniformity in nomenclature of our fruits, and was the author of the rules of nomenclature adopted by the American Pomological Society. He was always an ardent and consistent advocate of the selection of varieties of high quality. In 1896, the State Agricultural College, in recognition of his eminent ability as a pomologist and his wide influence in molding the horticulture of Michigan, conferred on him the honorary degree of Master of Horticulture.

Manning, Robert.

Robert Manning, pomologist, was born July 18, 1784. He died October 10, 1842. In 1823, he established his Pomological Garden, at Salem, Mass., which, at the time of his death, contained more varieties of fruits than had before been collected in America. The new pears of Van Mons were introduced largely by him. In 1838, he published his Book of Fruits, being a descriptive catalogue of the most valuable varieties of the pear, apple, peach, plum and cherry for New England culture. [Biographical sketch in Cyclopedia of American Horticulture, page 981.]

Manning, Robert, Jr. By *Byron D. Halsted.*

Robert Manning, Jr., horticulturist, was born at Salem, Mass., July 6, 1827. He died February 17, 1902. The senior Manning was one of the first fruit-growers of New England to assemble a large number of varieties into a test garden. The results of his work were published in the Book of Fruits, in 1838. Nine years earlier, he was a founder of the Massachusetts Horticultural Society, to which he afterward presented his library.

The father died when young Manning was only fifteen years old and he became the head of the "Pomological Garden," and at once was associated with the leading fruit-growers of America. At the age of twenty-one, he became a member of the special committee of the American Congress of Fruit Growers to prepare a List of Fruits for General Cultivation. A life member of the American Pomological Society, he served on most of the committees, and was its secretary from 1879 to 1881. From 1876 until his death (a period of twenty-six years), he was secretary of the Massachusetts Horticultural Society, during which time he edited its annual publications and, in 1880, a history of the Society, a large and comprehensive volume of great value. As the long-time administrative officer of the leading horticultural society in America, he became widely known at home and abroad for his kind helpfulness and sound learning. His stamp on the horticulture of this country was that of thoroughness, at a time when it required much courage, and was, therefore, all the more valuable.

Masterful of details in all things horticultural, always courteous and helpful, he made his office the Mecca of those who desired fresh knowledge of fruits and flowers. He lived for the art he espoused in youth, and laid down his pen at the end of more than sixty years of service to horticulture.

Mast, Phineas Peter. By *O. J. Edwards.*

Phineas Peter Mast, farm-implement manufacturer, was born in Lancaster county, Pa., January 3, 1825. He died at Springfield, Ohio, November 29, 1898. In early childhood, he removed to Champaign county, Ohio, and was reared amid prosperous rural conditions. He was graduated from Ohio Wesleyan University. He originated the now familiar horse cultivator that displaced hand-hoeing. Capital was secured at Springfield and, in 1856, the manufacture of this implement was established there. By 1871, he had acquired control of the business, incorporating it as P. P. Mast & Co. In 1876, he organized another implement manufacturing concern, Mast, Foos & Co., whose new factory was then considered the most palatial manufacturing plant. Three years later, he founded the Farm and Fireside farm paper, and the Springfield National Bank in 1882. His business management was notably successful. Throughout his life, he enthusiastically supported the Methodist denomination and ardently championed temperance. He bequeathed much of his wealth to religious and educational institutions.

Mayo, Mrs. Mary Anne. By *Jennie Buell.*

Mrs. Mary Anne Mayo (1845–1903), State Grange lecturer, was born on a farm in Calhoun county, Mich. In 1865, she married Perry Mayo, a farmer. She heartily promoted a high type of rural life in civil affairs, in farmers' club, Grange, home-reading circle, church and Sunday school. Her energies and organizing genius were devoted particularly to the farm home and its family life. As lecturer for the State Grange, she spoke in every county in the state, and did an incomparable work in hundreds of homes, where she was entertained. She inaugurated Children's Day in the Grange; organized a State Grange Fresh Air Department; secured country homes for scores of wayward girls through her membership on the Board of Control of the State Industrial School for Girls; obtained passage of resolutions favoring provision for women at the Michigan Agricultural College in every farmers' organization she associated with, and wrote and spoke tirelessly for it until it was accomplished; introduced and demonstrated the usefulness of Women's Sections of farmers' institutes, through talks on "Mother and Daughter," "Making Farm Work Easier," "Poultry Raising for Farm Women," "How to Keep the Boys on the Farm," "Mother and School," and "A Mother's Greatest Needs."

McAllister, Hugh Nelson. By *James A. Beaver.*

Hon. Hugh Nelson McAllister, lawyer, farmer, was born on his father's farm in Lost Creek Valley, Juniata county, Pa., June 28, 1809. He died at Philadelphia, May 5, 1873.

Young McAllister's early education was secured in the schools of his neighborhood and as a private student of Rev. John Hutchinson, pastor of the Lost Creek Presbyterian Church, attended by the family. He was graduated from Jefferson College, then at Canonsburg, Pa., in 1833. He was admitted to the bar of Center county, November 25, 1835, and entered immediately into partnership with W. W. Potter, one of its leading attorneys. He was married twice—first to Henrietta A. Orbison, of Huntingdon, Pa., by whom he had seven children, four of whom died in infancy. The first Mrs. McAllister died April 12, 1857, and on September 12, 1859, Mr. McAllister married Margaret Hamilton, of Harrisburg.

Although engaged in an extensive law practice during his entire life, Mr. McAllister never lost interest in agriculture, in which he was employed until he left home for college. After taking up his practice, he purchased a farm immediately adjoining Bellefonte, and for the remainder of his life gave personal direction to its cultivation. It is now in the possession of and cultivated by his grandson. He gave largely of time, means and influence to the organization and conduct of the state and county agricultural societies. Of the former, he was an active vice-president, and of the latter, the head and leading spirit. He was one of the incorporators, in the year 1855, of the Farmers' High School of Pennsylvania, now the Pennsylvania State College. Named in the act of incorporation as one of its trustees, he continued, by successive elections, in that position until the time of his death. He supervised the laying out of the experimental farm, and personally planned the series of experiments in regard to the rotation of crops and the application of fertilizers to the various plots into which the farm is divided for experimental purposes. The experiments so planned have been conducted continuously for more than forty years.

Mr. McAllister was an enthusiast, and one of the early advocates of instruction in the application of science to practical agriculture. The Farmers' High School of Pennsylvania was one of the very first institutions in the country which carried into practical effect the ideas underlying the great system of education accomplished in the state universities and colleges established under the Land-Grant Act. Mr. McAllister, it is safe to say, had more to do with the establishment of this system of education in Pennsylvania, beginning with the Farmers' High School, than any other one man. With Hon. Frederick Watts, subsequently Commissioner of Agriculture at Washington, and Hon. James T. Hale, then a member of Congress from his district, he had much to do with securing the passage of the Land-Grant Act of July 2, 1862, under which the so-called Land-Grant colleges in the several states have been established. Under the influence of these gentlemen and other friends of the Pennsylvania State College, then known as the Agricultural College of Pennsylvania, it was designated as the recipient of the Land-Grant fund by the legislature of the state.

Mr. McAllister uniformly declined to become a candidate for or to accept appointment to any public office. In 1872, however, he accepted a nomination for delegate-at-large to a convention to prepare for submission to the people a new constitution for the state. He was elected, and died while in the discharge of his duties as a member of that convention.

McGee, William Levi. By *B. M. Walker.*

William Levi McGee, teacher, was born March 22, 1862, in Holmes county, Miss. He died October 22, 1896. He spent his boyhood days on the farm. He secured his early education in the country schools of his native county, and entered the Mississippi Agricultural and Mechanical College in 1881, from which he was graduated in 1885 with the degree of Bachelor of Science. He served as an instructor in the preparatory department of the college, and then was elected principal of the high school at Enterprise, Miss. He was called back to the Agricultural and Mechanical College as instructor in mathematics, and was promoted to be assistant director of the Federal Experiment Station. In this position, he had in charge a great deal of experiment station work, and took an active part in the agricultural work of the state, especially in grasses and forage crops. He was called to South Carolina as Professor of Agriculture in Clemson College, and filled this position with credit and distinction until his untimely death, caused by accident. He was a brilliant, conservative, well-balanced man.

M'Mahon, Bernard.

Bernard M'Mahon, horticulturist, was born in Ireland about 1775. He died September 16, 1816. He came to America in 1796, and settled in Philadelphia, where he engaged in the seed and nursery business. He was the means of making many of our native plants known in Europe, through his exportations. In 1806, he gave to America its first great horticultural book, American Gardener's Calendar. [See biographical sketch in Cyclopedia of American Horticulture, page 963.]

Meehan, Thomas. (Fig. 144.) By *W. E. Meehan.*

Thomas Meehan, writer, editor, state botanist, vegetable biologist, legislator and nurseryman, was born in London, England, March 21, 1826. He died at Germantown, Philadelphia, November 19, 1901. His father, Edward Meehan, was head gardener for Col. Francis Vernon Harcourt, at St. Clare, near Ryde, Isle of Wight, and there Thomas spent his boyhood. He was self-educated, acquiring Latin, Greek, French and the elements of botany by studying at night.

Mr. Meehan's first published paper was at the age of twelve on the production of double-flowered stocks from single. His first scientific discovery published was on "The Sensitive Nature of the Stamens of the Portulaca," at fifteen years of age. At the same age, he produced St. Clare, the first hybrid fuchsia known to the horticultural world. Numerous scientific papers followed, resulting in his being elected member of the Royal Wernerian

Society of Edinboro, without making application or the Society being aware that he was a boy. Thomas Meehan became a student at Kew Gardens, and after graduation came to America, landing on his twenty-second birthday. Here he was employed by Robert Buist, Sr., in Philadelphia; was superintendent of Bartram's Gardens, and later gardener to Caleb Cope, Holmesburg, and while there flowered the *Victoria Regia*, the second time blossomed in America. In 1853, he established Meehan's nurseries, afterward famous for their fine collection of American trees. He was sole editor of the Gardener's Monthly for the thirty years of its life, beginning in 1859. He founded Meehan's Monthly in 1891, which survived his death. For sixteen years he was agricultural editor of Forney's Weekly Press, and at one time was agricultural or horticultural editor or regular contributor to more than half a dozen weekly and monthly papers and magazines. For thirty years he was the regular scientific editorial contributor to the New York Independent. He was appointed State Botanist by Governor Hoyt and held that position until his death. For many years he was a member of the Board of Visitors of Harvard University. He was a prolific contributor to the publications of the Academy of Natural Sciences of Philadelphia, of which institution he was senior vice-president for twenty-three years; to the proceedings of the American Association for the Advancement of Science, of which he was one of the early Fellows, and to the American Philosophical Society, the Pennsylvania Horticultural Society, the Pennsylvania Agricultural Society, in all of which he was an active member. He was recognized as the leading vegetable biologist of his day. He was the originator of the doctrine of evolution that self-sacrifice plays as important a part in nature and evolution as the struggle for existence and the survival of the fittest. For his scientific attainments in horticulture he was awarded the Veitch medal by the Veitch Memorial Fund of England, the third American so honored. He was the author of Native Flowers and Ferns of the United States. He was elected a member of the Common Council of Philadelphia in 1882, and was reëlected biennially thereafter as long as he lived. As councilman, he inaugurated a movement for numerous small parks in Philadelphia. He was a member of the Germantown school board for eighteen years, and during that period secured the establishment of seven new schools, two exclusively for colored teachers. Other of his activities that may be mentioned are as follows: He discovered the Englemann Canyon in the Wasatch mountains; in Alaska, he discovered the movements of plants in connection with the movements of glaciers; at the close of the war, he went south as a member of a committee to restore confidence and business relations between the two sections; he made what is supposed to be the first complete list of plants in Kew Gardens, over 1,600 plants being recorded; he was largely instrumental in the establishment of the Department of Forestry in Pennsylvania.

Fig. 144. Thomas Meehan.

Mr. Meehan is survived by Catharine Emma Colflesh, to whom he was married in 1852, and six children, William E., Commissioner of Fisheries of Pennsylvania; Thomas B., J. Franklin, and S. Mendelson, of the Nursery Firm of Thomas Meehan & Sons, Inc.; Sarah D. Lanning and Frances G. Burn.

Miles, Manly. (Fig. 145.) By *C. S. Crandall.*

Manly Miles, physician, zoölogist, teacher, experimenter, writer, was born in Homer, Cortland county, New York, July 20, 1826. He died February 16, 1898. In 1837, he moved with his parents to Genesee county, Mich., where, for several years, his time was divided between school and pioneer farming. Later he taught in the country schools. A well-developed taste for natural history gave direction to his studies and led him to make collections of the local fauna and flora. Deciding upon medicine as a profession, he entered Rush Medical College, Chicago, from which he received his degree

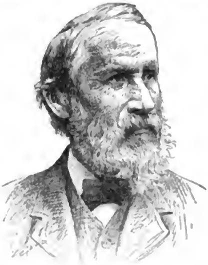


Fig. 145. Manly Miles.

in 1850. Returning to Michigan, he practiced his profession until 1859, when he entered the newly organized State Geological Survey as State Zoölogist. Competent authorities pay high tribute to the value of the work done by Dr. Miles during the three years of his connection with the survey. His catalogue of the mammals, birds, reptiles and molluscs, prepared for the Geological Survey Report for 1860, has served as the basis for subsequent work on these lines.

In 1861, Dr. Miles was appointed Professor of Zoölogy and Animal Physiology in the Michigan Agricultural College. In 1865, the Michigan State Board of Agriculture established the chair of Practical Agriculture, which was offered to Dr. Miles. His inclination was to continue work in zoölogy and physiology, but finally he accepted the newly created position and thus became the first Professor of Agriculture in the United States. His early life on the farm, his broad training in the sciences closely related to agriculture, and his untiring zeal, combined to make his teaching of agriculture as successful as was his teaching in zoölogy and physiology. He was a firm believer in the laboratory method of teaching.

In 1875, Dr. Miles resigned his professorship and accepted a similar position in the University of Illinois. Later, he moved to Houghton Farm, the estate of Valentine Lawson, near Mountainville, N. Y., where he engaged in the conduct of agricultural experiments. Later, he returned to teaching, as Professor of Agriculture in the Massachusetts Agricultural College at Amherst. In 1886, he went to Lansing, Mich., where he pursued scientific studies in agriculture and physics until the time of his death, in 1898. He delivered many lectures at farmers' institutes and before societies, and was the author of a number of agricultural and scientific papers. He was the author of three well-known books: Stock Breeding, issued in 1878; Silos, Ensilage and Silage, issued in 1889; Land Drainage, issued in 1892.

Dr. Miles was a close and critical student, who kept in touch with scientific achievements in all lines relating to agriculture. He was a keen observer, accurate and enthusiastic in experimentation and logical in his reasoning.

Montgomery, William Bell. By *M. L. Montgomery.*

William Bell Montgomery, farmer, editor, was born in Fairfield district, S. C., August 21, 1829. He died September 25, 1904, in the old home near Starkville, Miss. His parents moved into Mississippi when he was six years old. His boyhood was spent in the country, where he imbibed the industrial spirit that so characterized his acts in later life. He attended the best schools in Mississippi and Tennessee, was a student in Erskine College at Due West, S. C., and then went to Princeton University, where he was graduated in 1850. He returned to Mississippi and engaged in agricultural pursuits. Later, in Mobile, Ala., he entered the cotton commission business, but in a few years, his health failing, returned to Mississippi and renewed his farm operations.

After the Civil war he was a pioneer in his section. Full of hope and with undaunted courage, he addressed himself to the readjustment of affairs. He favored diversified farming, introduced new grasses for hay and pastures, and turned his attention to stock-raising. He conducted a successful dairy business for more than thirty years and accomplished much in the way of advancing the stock and agricultural interests of his state. He established the Southern Live Stock Journal. He introducted Jersey cattle into the Gulf states. For thirty-two years he was a member of the American Jersey Cattle Club, and served on its board of directors. He was one of the most extensive land-owners in Oktibbeha county. He was deeply interested in educational and religious work. He began the agitation that resulted in the establishment of the Mississippi Agricultural and Mechanical College, the location of which, by tremendous effort, he secured to his own county of Oktibbeha. His support of the president and faculty and his influence on the board of trustees, during the twenty years which he served as local trustee, did much to establish the institution on a successful basis.

Moore, J. B.

Capt. J. B. Moore, of Concord, Mass., was a member of the Massachusetts State Board of Agriculture from 1861–1887, representing the old Middlesex Agricultural Society. He served as a member of the executive committee of the board and as a member of the examining committee of the Agricultural College. He was the originator of Moore's Early Grape.

Morrill, Justin Smith. See page 414.

Morrison, William Henry.

William Henry Morrison, superintendent of farmers' institutes, was born in Yorkville, Oneida county, New York, in 1837. He died at Madison, Wis., December 13, 1893, from a fall on an icy sidewalk. He went to Wisconsin in 1859, and settled in Walworth county. His education was secured in the common schools and in Milton College. After leaving school, he engaged in farming. He was married September 24, 1862, to Julia M. V. Heath, who, with two children, survived him. While a resident of Walworth county, Mr. Morrison was elected register of deeds three terms, and was secretary of the Walworth Agricultural Society nine years; was president of the Wisconsin State Dairymen's Association three terms; for several years, was one of the proprietors of the Western Farmer, and during his life was one of the leading members of the State Agricultural Society. On the organization of the Wisconsin Farmers' Institutes in 1885, he was made superintendent, a position he held until his death.

Mr. Morrison's public reputation rests mainly on his work as secretary of the Walworth County Agricultural Society and in the farmers' institute work he accomplished. He had organizing genius. From an unheard-of thing, he made the Walworth

County Fair known all over the United States in agricultural society circles. It stands today the strongest society of its class in the West. He took charge of the farmers' institutes when they were undeveloped and made them so useful and effective that the state was glad to more than double the appropriation, and made for his state and himself a far-reaching reputation in farmers' institute work. In the work of agricultural education he could see a lever lifting farm life to better and happier ways. And so the enthusiasm which filled him was of the best, and was contagious because it was so warm and so honest. Mr. Morrison's life and work has been worth millions of dollars to his state. His monument will be a more profitable agriculture, a broader and deeper farm mind and a happier farm life. Gentle in his ways, strong in his affection, rich in comprehensive charity, singularly free from the poison of malice and the folly of envy, he represented a rare Christian manhood. [Adapted from an obituary prepared by Hon. H. C. Adams and published in the Wisconsin Annual Farmers' Institute Bulletin, No. 8, 1894.]

Morrow, George Espy. (Fig. 146.)
By *E. Davenport.*

George Espy Morrow, agricultural writer, professor of agriculture, college president, was born on a farm in Warren county, Ohio, October 19, 1840. He died on his farm in Paxton, Ill., March 26, 1900. He was the youngest child in a family of nine. He was intimately acquainted with the methods of pioneer farming in western Ohio, and became interested in agriculture in childhood through the exhibits of the Warren county agricultural fair. He took early advantage of the rather exceptional collection of books and periodicals provided in his father's family. At fifteen years of age, he entered Maineville Academy, where he prepared his first written document, "The Effects of Universal Education." Leaving the academy, his plans were formed for entrance to Miami University at Oxford, but, instead, he enlisted in the army, August 17, 1861.

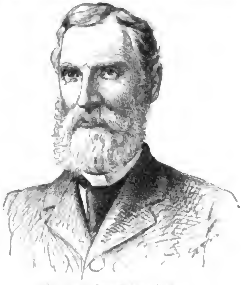


Fig. 146. George Espy Morrow.

While enlisted, he wrote letters to the Cincinnati Gazette, and later to the New York Tribune. Discharged from the army in 1863 for disability, he taught school in the neighborhood of Minneapolis, Minn. At the end of the year he accompanied his brother to the University of Michigan, where he took a course in law.

In 1865, Mr. Morrow did his first writing for the agricultural press, and soon became assistant editor of the Western Rural, then published in Detroit. In 1867, he married Sarah M. Gifford. In the same year, the paper moved to Chicago, in which place his work was so successful as to encourage in him the ambition to own and manage a farm paper of his own. Two years later, he and his eldest brother bought the Western Farmer of Wisconsin, and he moved his home to Madison. It was here that he made his reputation as an agricultural writer. However, the Journal never became profitable, the circulation diminished in the hard days of the early 70's and the paper was merged with the Western Rural in 1875. The death of his elder brother caused him to assume all financial obligations of the company, a burden that required many years for its discharge. He continued with the Western Rural only a year, when this paper also failed, early in 1876.

The same year, 1876, Mr. Morrow was elected Professor of Practical Agriculture in the Iowa State Agricultural College. His ten years' editorial experience, his natural fluency with the pen, his wide knowledge, and his ability to see many things in their relations, all conspired to make him a most popular teacher of young men, and a most entertaining as well as a popular lecturer before farmers. In 1877, he was called to a similar position in the Illinois Industrial University, a position he held until August, 1894. The University of Wisconsin, in 1882, conferred on him the degree of A.M., an honor that was well earned and fully substantiated by his later success. In July, 1895, he was unanimously elected president of the Oklahoma Agricultural and Mechanical College at Stillwater, a position he held until failing health compelled him to retire on June 30, 1899, after four years of conspicuously successful service as president.

Professor Morrow was noted for his kindly, genial personal qualities, and his varied rather than his deep scholarship. Few men of his time foresaw as clearly the future development of American agriculture, and the need for definite investigations into the problems of farming. He commenced systematic research in corn-production a number of years before the founding of the experiment stations, and a tract of land of the University of Illinois is still (1907) under the rotation established by him twenty-nine years ago.

Morton, Julius Sterling. (Fig. 147.)

Julius Sterling Morton, Secretary of Agriculture, was born at Adams, N. Y., April 22, 1832. He died at Lake Forest, Ill., April 27, 1902. His parents removed to Michigan, when he was two years old. At fourteen, he entered the Methodist Seminary, at Albion. In 1850, he began his course in Michigan University. He did not finish the course here, but received his degree from Union College, in 1854. In the same year he married Caroline Joy French, of Detroit. He then moved to Nebraska, and finally settled near Nebraska City, where he became a practical farmer.

Fig. 147. Julius Sterling Morton.

Of special interest in this connection was the appointment of Mr. Morton, by President Cleveland, in 1893, as Secretary of Agriculture. His service for agriculture was varied and extensive. He was president of the Nebraska Territorial Board of Agriculture, of the Territorial Horticultural Society, and of the Nebraska State Historical Society. In 1858, he was appointed by President Buchanan, secretary of the territory of Nebraska. He was four times the Democratic candidate for governor of Nebraska, and was twice the candidate for Congress. He was the originator of "Arbor Day."

Nettleton, Edwin S. By *R. P. Teele.*

Edwin S. Nettleton, irrigation engineer, was born at Medina, Ohio, October 22, 1831. He died April 22, 1901. He married Lucy Grosvenor, October 17, 1861. He attended public school at Medina and Oberlin College, but did not graduate because of trouble with his eyes. He studied and practiced mechanical engineering for three years; practiced engineering and was in the lumber business in Kalamazoo, Mich., 1858–64. In 1864, he went to the oil regions of Pennsylvania, where he practiced his profession, becoming, in 1867, the chief engineer of the Oil Producers' Association of Pennsylvania.

In 1870, Mr. Nettleton joined the Union Colony, which founded the town of Greeley, Colo., and became the engineer of the colony. In the following year he became chief engineer of the Colorado Springs Colony, laying out the city of that name, and its parks and canals. In 1872, he was employed by the Colorado Improvement Company, now the Colorado Fuel and Iron Company, the largest producers of coal and iron in the West, in locating coal and iron lands. In 1878, he entered again into irrigation engineering, as engineer of the Colorado Mortgage and Investment Company, supervising the survey and construction of what is known as the Highline Canal, from the South Platte river, one of the largest canals on that stream. In 1884, he was appointed state engineer of Colorado, holding that office for four years. In 1889, he became supervising engineer for the eastern part of the arid region, under the United States Geological Survey, and, on the creation of the Artesian and Underflow Investigation in the United States Department of Agriculture, was transferred to that service. From this work he returned to private practice, doing consulting work in irrigation engineering throughout the western United States and in Mexico. In 1899, he returned to the government service as an engineer in the Irrigation Investigations of the Department of Agriculture. He continued in this work until the time of his death. He was the author of a number of official reports as state engineer of Colorado and in connection with his work for the national government.

Colonel Nettleton's most notable work was in irrigation. In this field he was a pioneer. Irrigation had been practiced in the United States for twenty years before he entered this field, but irrigation engineering was undeveloped. The canals of the Union Colony, near Greeley, were among the first large ones built in this country, and from the construction of these canals, Colonel Nettleton became a recognized leader in irrigation engineering. Systems of canal management and of water laws were also lacking, and, as a canal-builder and manager, Colonel Nettleton found it necessary to work out such systems. That this work was well done is shown by the fact that the system of stream control, established first in Colorado, has been maintained until the present time, and has been copied by every arid state which has provided any such system, and by the further fact that Colorado has, today, a larger area of irrigated land than any other state in the Union.

Newton, Isaac. By *John Lee Coulter.*

Isaac Newton, farmer and first Commissioner of the United States Department of Agriculture, was born in Burlington county, New Jersey, March 31, 1800. He died at Washington, D. C., June 19, 1867. After a good common school education, he married and settled down to pursue his life work, farming. He began in Delaware county, Pennsylvania, just at the time that the first agricultural paper appeared in the United States, and he was in the district which first felt the effect of the agricultural awakening which developed with the second quarter of the century. During this period, he read carefully all that appeared on agricultural subjects. He joined the Pennsylvania Agricultural Society at an early date, and after the formation of the United States Agricultural Society he was sent as a delegate to many meetings by his neighbors and by the state society. As a member of these societies, he early introduced resolutions urging Congress to establish a department of agriculture. With others of his time, he kept up an agitation for nearly twenty years before success crowned his efforts. Personally, he presented the claims of the agricultural classes to Presidents Harrison, Taylor, Fillmore, Buchanan, and Lincoln, but it was not until 1862 that the department was finally established.

Newton was known in the Middle Atlantic states as a model farmer. Being well qualified, he was offered the position of Commissioner of the Department of Agriculture when the Department was established under the law approved May 15, 1862. He accepted the burden of establishing the new department; and how well he performed this duty is illustrated by the success of the undertaking and the rapid growth of the new branch of the national government.

Five volumes, the first five annual reports of the commissioner of agriculture, remain as a written monument to his name. His reports show a knowledge of the history of agricultural progress from the time of the Romans to that during which he lived. He knew of the development of all phases of agriculture prior to his time, and the movement at that time. His philosophy of the needs of the time and the scope of his undertaking is clear from his own statement of the case. He urged peace as a prerequisite to the best agricultural success. Following peace, he was for "a continued and increasing demand for agricultural products, both at home and abroad;" and he urged "an increased respect for labor," for otherwise agriculture would never be able to hold first place. Finally, he saw the need for "a more thorough knowledge and practice of agriculture as an art and science," and called for a "a more thorough education of our farmers in the physical sciences, in political economy, in taste, and general reading." He used every effort to carry out these great principles.

Nichols, James Robinson. By *A. P. Nichols.*

James Robinson Nichols, farmer, chemist, was born at West Amesbury, now Merrimac, Mass., in 1819. He died in 1888 at Haverhill, Mass. His boyhood was passed on his father's farm, where he secured a practical knowledge of the principles of agriculture. He studied chemistry especially, and although he received the degree of Doctor of Medicine from Dartmouth College, he never practiced, but entered into a successful business as a manufacturer of chemical and pharmaceutical preparations. In 1863, he purchased a tract of land in Haverhill, Mass., where he conducted numerous experiments with chemical fertilizers, and other improved methods of agriculture. The results of these experiments were published, mainly in the Boston Journal of Chemistry, a scientific journal founded by himself in 1866, and exerted a marked influence on the agriculture of Essex county and even of the state.

A novel proceeding was a course of "Barn-Floor Lectures," which he delivered on the farm premises, in which he demonstrated the home manufacture of chemical fertilizers to an audience of local farmers.

Chemistry of the Farm and Sea, a small volume published in 1866, was Nichols' only distinctively agricultural publication in book form. He was for many years a member of the Massachusetts State Board of Agriculture, and had numerous business interests apart from his experimental farm.

Norton, John Pitkin. By *W. H. Brewer.*

John Pitkin Norton, educator, chemist, was born in Albany, N. Y., July 19, 1822. He died in Farmington, Conn., September 5, 1852. His boyhood was spent on his father's farm in Farmington. He studied the sciences, particularly chemistry. His winters were spent in school, or under private instruction, and he studied chemistry in the private laboratory of Professor Silliman at Yale. In 1844, he went to Edinburgh, Scotland, and spent two years in the laboratory of the Agricultural Chemical Association, under the instruction of Professor Johnston. While here, he received a prize of fifty sovereigns from the Royal Highland Agricultural Society, for investigations, largely chemical, on oats. In 1846, when Yale College established a department of Philosophy and Arts, Mr. Norton was appointed Professor of Agriculture, later changed to Professor of Agricultural Chemistry. He then returned to Europe for further study in the laboratory at Utrecht, under Professor Mulder. In 1847, his active duties as Professor of Agricultural Chemistry began. This was the beginning of that department of Yale University, since 1860 known as the Sheffield Scientific School. He remained in this position until his death.

Mr. Norton did much for the cause of agricultural chemistry. Besides his work at Yale, he delivered many public lectures, notably at Albany, N. Y. He contributed to the Cultivator. He wrote and published the Elements of Scientific Agriculture (Albany, 1850). Before his death, he prepared the American Appendix to Stephen's Book of the Farm, Farmer's Guide to Scientific and Practical Agriculture (2 Vols., N. Y., 1858). He died at the age of thirty years. Seldom, if ever, has a man of so few years left so important an influence on scientific agriculture.

Ohmer, Nicholas. By *W. J. Green.*

Nicholas Ohmer, horticulturist, was born in France in 1823, and died in Dayton, Ohio, February 27, 1903. When twelve years old he came to Dayton, which became his permanent home. He was for thirty-five years president of the Montgomery County Horticultural Society, holding that office from the organization of the society until his death. He was four years president, and at other times treasurer and vice-president of the Ohio State Horticultural Society. He was a member of the first Board of Control of the Ohio Agricultural Experiment Station, and was on the State Board of Agriculture. In the introduction of the Gregg raspberry, Mr. Ohmer gave a great impetus to small-fruit culture. He originated no new varieties of fruit. He but seldom wrote for the press, but was an inspiring speaker and a born leader.

Olmsted, Frederick Law. (Fig. 148.)

Frederick Law Olmsted, landscape architect, was born at Hartford, Conn., on April 26, 1822. He died at Waverly, Mass., August 28, 1903. From his earliest boyhood, he was interested in the natural beauties of the open country. At the age of fourteen, eye troubles forced him to quit school, and he entered the home of a country minister, where he learned the rudiments of mechanical engineering. Two years later he became a clerk in a business establishment in New York City; left this to go to sea for a year, and then on to a farm. He left the farm long enough to spend two years at Yale College, studying agriculture and engineering. Subsequently he removed to a farm on Staten Island. In 1850, he travelled by foot through parts of Great Britain and the Continent, studying agriculture and landscaping, and published his observations in Walks and Talks of an American Farmer in England. Three tours of the southern states resulted in his three books, a Journey in the Seaboard Slave States (1856), A Journey in Texas (1857), A Journey in the Back Country (1861). He was at one time editor of "Putnam's Magazine." In 1857, he became superintendent of the laying out of Central Park, New York City, authorized by the legislature of 1855. The plan submitted by Calvert Vaux and himself was accepted. In four years the work was largely completed. In 1859, he married Mrs. Mary Perkins Olmsted, widow of his brother. From 1861 to 1863, he was organizer and manager of the Sanitary Commission at Washington, D. C. He helped to organize the Southern Famine Relief Association and the Union League Club. Later he was commissioner of the Yosemite National Park; helped to lay out Prospect and Washington Parks, Brooklyn; Seaside Park, Bridgeport, Conn.; Washington and Jackson Parks, Chicago; Mount Royal Park, Montreal; designed the Capitol grounds at Washington; planned the scheme for the preservation of the natural scenery of Niagara Falls; designed the grounds of a large number of colleges and universities, and public and private parks of greater or lesser prominence.

Fig. 148. Frederick Law Olmsted.

Orton, Edward [Francis Baxter].
By *Edward Orton, Jr.*

Edward [Francis Baxter] Orton, geologist, was born at Deposit, N. Y., March 9, 1829. He died at Columbus, Ohio, October 16, 1899. He inherited from his father, Rev. Samuel G. Orton, a taste for and knowledge of agricultural pursuits, which remained with him until his death. During his early life he maintained his garden and orchard. As state geologist of Ohio, while traveling among farmers, collecting data concerning mineral wealth, he instructed and inspired hundreds of farmers. Many farmers received their first conception of the relation of science to agriculture from his friendly talks. In his geological survey reports, he incorporated observations concerning the nature of the soil, and the relation between geology and agriculture.

Owen, David Dale. By *A. M. Peter.*

David Dale Owen, geologist, was born June 24, 1807, at Braxfield House, Lanarkshire, Scotland. He died in New Harmony, Indiana, November 13, 1860. He was the son of Robert Owen, mill owner and philanthropist. He received his collegiate education at Hofwyl, Switzerland, devoting attention especially to chemistry, the study of which he continued in Glasgow and London. In 1828, he came to the United States, and settled in New Harmony, Indiana. In 1833, he was with Dr. Gerard Troost in a geological reconnoissance of Tennessee. He then studied medicine, taking his medical degree at the Ohio Medical College, Cincinnati, in 1835. In 1837, he was married to Caroline Neef. The same year he was appointed Geologist of Indiana. In 1839, he was appointed by the Federal Government to explore the mineral lands of Iowa, Wisconsin and Illinois. Again, in 1847 to 1850, he surveyed in Wisconsin, Iowa, Minnesota and part of Nebraska, an area exceeding two hundred thousand square miles. In 1854, he was appointed principal geologist of Kentucky. In 1857, he became state geologist of Arkansas and made a general reconnoissance of that state, at the same time continuing to direct the work in Kentucky. In 1859, he was again appointed chief geologist of Indiana, under the auspices of the State Agricultural Society. In addition to these public labors, Dr. Owen made many geological explorations for individuals and corporations and contributed to various scientific and other journals.

Dr. Owen was both chemist and geologist and, in his agricultural surveys, advocated the chemical study of soils for the purpose of determining what chemical elements are deficient in naturally poor soils or in those that have become infertile through long cropping. His work, in connection with that of Dr. Robert Peter, in the geological and agricultural surveys of Kentucky, Arkansas and Indiana, represents, probably, the earliest extensive and systematic chemical study of soils made in this country.

As a man, Dr. Owen was modest and undemonstrative, yet firm, independent and self-reliant. Wholly absorbed in his much-loved science, his money, time, and even his life, were freely and exclusively spent in its pursuit.

Packard, Alpheus Spring, Jr.

Alpheus Spring Packard, Jr., scientist, entomologist, was born February 19, 1839, at Brunswick, Maine. He died February 14, 1905. In 1861, he was graduated from Bowdoin college, where his father was for sixty years a member of the faculty. In the same year that he was graduated, he was made entomologist on the corps of the Maine Geological Survey. His, How to Observe and Collect Insects, brought him to the notice of Agassiz, and resulted in his becoming the latter's private assistant. During this time he wrote his essay on the Army Worm. At the same time he devoted himself to the study of zoölogy and medicine, and in 1864 received his M.D. He then entered the army. On his return, in 1865, he became librarian and custodian at the Boston Society of Natural History. In 1866, he entered the faculty of the Essex Institute, in Salem, Mass., and shortly after he accepted a position in the Peabody Academy. This he resigned in 1878, and became professor of zoölogy and geology in Brown University. In addition to his regular work, he established a summer school of biology in Salem, and was an instructor in Agassiz's Science School at Penikese, in 1873-74. He was largely responsible for the establishment of the American Naturalist, and was its editor-in-chief. In 1871-73, he was State Entomologist of Massachusetts. He was a member of the United States Entomological Commission, and in 1875-76 was assistant zoölogist on the United States Geological and Geographical Survey of the territories. In 1874 he was assistant on the Kentucky geological survey. He was a voluminous writer, and contributed largely to our knowledge of natural-science subjects.

Parsons, Samuel B. (Fig. 149.)
By *Byron D. Halsted.*

Samuel B. Parsons, horticulturist, was born February 14, 1819, in New York City. He died in Flushing, N. Y., January 4, 1906. Sixty-five years of his life were spent in active horticultural pursuits. In 1839, he engaged in the nursery business with his brother Robert, at Flushing, and gave particular attention to the growing of native trees and shrubs. By a tour through Europe, in 1845, he broadened his knowledge of the subject in hand, and shortly after established a trial plantation in Florida. In 1859, under a commission from the national government, Mr. Parsons made an investigation of the horticulture of Sicily and the Ionian Islands, and his report was accepted as an authority on the industry he had deeply at heart. Mr. Parsons was greatly interested in Japan, being one of the first to avail himself of the port there opened by Commodore Perry. The introduction of the Japanese maples was one of the achievements of the Parsons' Nurseries. They were also the first to propagate the rhododendrons in the United States. In 1871, Samuel succeeded to the whole business, which was continued as the Kissena Nurseries until within a short period of his death.

Fig. 149. Samuel B. Parsons.

Mr. Parsons made many addresses on horticulture and landscape-gardening. His volume, The Rose, its History, Poetry, Culture and Classification, is among the classics of floricultural literature. He was a charter member of the American Pomological Society, an honorary member of the Massachusetts Horticultural Society from 1856, and an efficient member of many educational and philanthropic organizations.

Pearson, Alexander W. (Fig. 150.)
By *Byron D. Halsted.*

Alexander W. Pearson, horticulturist, was born November 8, 1828, and died at his home December 15, 1903. He spent his early years on a large farm near Quincy, Ill. While yet a youth, Alexander became acquainted with Abraham Lincoln, John Hay, Stephen A. Douglas and others who, in later years, became prominent in political life. He studied law and medicine, but did not graduate in either. He was appointed, July 22, 1862, assistant paymaster in the Mississippi Division of the Navy.

Mr. Pearson settled in Wilmington, Del., after leaving the service, where his parents were then living, but removed with them to Vineland, N. J., in 1871. He was a successful grower of fine fruits and for several years conducted an experiment station for the United States Department of Agriculture, at one time paying much attention to the diseases of the grape and their remedy. Colonel Pearson was one of the first in America to demonstrate the practical value of spraying plants to check fungous diseases. He contributed many articles to the press on subjects under consideration on his fruit-farm, and was a leading member of the New Jersey Horticultural Society, being its president in 1886 and 1887.

Pendergast, William Wirt. By *J. A. Vye.*

William Wirt Pendergast, farmer, educator, was born January 31, 1833, at Packer's Falls, Durham, N. H. He died at Hutchinson, Minn., July 17, 1903. His parents were Solomon and Lydia (Wiggin) Pendergast. William was the oldest of a family of five children. He grew up on the home farm, attending the district school. He was graduated from the academy at Durham in 1850, and in the same year entered Bowdoin College, earning the money for his higher education by teaching. His college life was followed by three years of teaching in Massachusetts' graded schools, one year in Amesbury and two in Essex. In the spring of 1856, Mr. Pendergast went to Minnesota, took up a claim in McLeod county, and together with two members of the Hutchinson family of singers, whom he dissuaded from their scheme to locate a town in Kansas, and with a few other young men, founded the town of Hutchinson in McLeod county. Here he became a leader in educational and agricultural work. He made it a practice to improve whatever property he had by setting out shade and fruit trees, and today, after a period of more than fifty years, these trees stand as monuments to the man whose persistent efforts in this line made him a public benefactor. Later, he returned to Essex, Mass., where he was married to Abbie Lowe Cogswell.

After being principal of schools in Hutchinson for twenty-five years, during eight of which he was also County Superintendent of Schools, Mr. Pendergast was appointed Assistant Superintendent of Public Instruction of Minnesota. This position he held for seven years, when he was appointed Principal of the School of Agriculture by the Board of Regents of the University of Minnesota. This was a new departure in education and in reality the foundation of practical primary work in methods in agriculture, and the Regents insisted that Mr. Pendergast was the man especially fitted to develop the work. He proved to be the right man for the place. From this position he was called to become State Superintendent of Public Instruction in 1895. He resigned this position in January, 1899, and returned to his home at Hutchinson, where he had retained direction of his farms during his years of public service.

Fig. 150. Alexander W. Pearson.

Mr. Pendergast was an enthusiastic supporter of the University and of secondary schools, but his affection reached out in an especial manner to the rural schools, as he believed that the welfare of the state depended largely on the character of the work in the district schools. His influence extended over the entire state. He was broad-minded, liberal and generous to a fault, and his life was full of happiness gained through kindness shown to others.

Perley, Samuel Farnsworth. By *S. L. Boardman.*

Samuel Farnsworth Perley, farmer, fourth child of Thomas Perley, was born in Bridgton, which later became a part of the town of Naples, Maine, June 30, 1817. He died in the house in which he was born, May 4, 1881. In early life, he attended academies in North Bridgton and at Gorham, relinquishing his wish for a college education at the request of his father, who desired him to take the management of his large farm. This he did at his father's death in 1842, when he was twenty-five years of age. A man of active affairs, he did not concern himself with politics, excepting when some measure relating to agriculture was likely to come before the state legislature. He was the leading farmer in western Maine and managed his large farm with great success, bringing the first mowing-machine into his section of the state and following it with the best farm machinery. About 1854, he organized a farmers' club and library at Naples and arranged lectures on agriculture to be given in towns in Cumberland county. He was a member of the Maine State Board of Agriculture for the terms 1858 to 1860, and again, 1862 to 1864. Mr. Perley had much to do with shaping the affairs of the state college of agriculture—now the University of Maine—in the earlier years of its history. In 1864, he was appointed by Gov. Samuel Cony, as member of a commission to receive proposals for the location of the college, which was finally established at Orono, by vote of the commission at a meeting held in January, 1866. Mr. Perley was for some years one of the original trustees of the college, which board consisted of sixteen members, one from each county in the state. Later, owing to ill health and an increasing infirmity of deafness, Mr. Perley was obliged to give up participation in the work of the board and in other concerns of public life.

Peter, Robert. By *A. M. Peter.*

Dr. Robert Peter, chemist, physician, was born at Launceston, Cornwall, England, January 21,

1805. He died near Lexington, Kentucky, April 26, 1894, leaving a family of eight children. He came to America when twelve years old, and settled at Pittsburg, Pa., going to work in a wholesale drug store. Here he developed a taste for chemistry, giving much attention also to botany and geology. He became a naturalized citizen of the United States in 1828. In this year he attended one session at the Rensselaer Institute Scientific School, Troy, New York, where he acquired the title of Lecturer on the Experimental and Demonstrative Sciences. The same year he delivered a course of chemical lectures to a small class at Pittsburg. He was a member of the Pittsburg Philosophical Society, before which he gave lectures in 1829; in 1830–1831, he lectured on chemistry in the Western University of Pennsylvania; in 1832, in Lexington, Kentucky, he became associated with Rev. B. O. Peers in the proprietorship of the Eclectic Institute, and in the same year accepted the position of Adjunct Professor of Chemistry in Transylvania University at Lexington; in 1833, he was elected to the Chair of Chemistry in Morrison College of Transylvania University. He received the degree of Doctor of Medicine in the medical department of the same university in 1834, and practiced medicine a short time in Lexington. In 1835, he married Frances Paca Dallam. In 1838, he was elected to the Chair of Chemistry and Pharmacy in the Medical Department of Transylvania University, which position he held until the close of the school in 1857, being also Dean and Librarian from 1847 to the close. In 1839, he was sent to London and Paris to purchase books and apparatus for the Medical Department. In 1850, he assisted in founding the Kentucky School of Medicine in Louisville, Ky., in which he occupied the Chair of Chemistry until 1853. In this year he prepared a memorial to the legislature in favor of a geological and agricultural survey of the state. The survey was established in 1854, under the directorship of Dr. David Dale Owen (see page 601), Dr. Peter becoming its chemist, which position he held until the discontinuance of the survey at the beginning of the Civil war. He was probably the first American chemist to make a large number of systematic analyses of soils for the purpose of comparing their resources in the principal elements of fertility.

Dr. Peter was an ardent supporter of the Union and, during the Civil war, was actively engaged as assistant surgeon in charge of military hospitals in Lexington, where he showed great executive ability. In 1865, he became Morrison Professor of Chemistry and Physics in the newly established Kentucky University, at Lexington, and Professor of Chemistry and Physics in the Agricultural and Mechanical College. These positions he continued to fill until the separation of the Agricultural and Mechanical College from Kentucky University in 1878, when he went with the former, continuing in its service as Professor of Chemistry and Physics until he retired as honorary emeritus professor in 1887. When the Kentucky geological survey was reorganized in 1873, under the directorship of Prof. N. S. Shaler, Dr. Peter again became its chemist, and continued to hold that position until the discontinuance of the survey in 1892. The results of this work, scattered through the several volumes of Reports of the Kentucky Geological Survey, constitute, perhaps, Dr. Peter's most considerable contribution to agricultural science.

Dr. Peter was a frequent contributor to local agricultural papers. At one time, 1867–68, he assisted in editing the Farmers' Home Journal, then published in Lexington. In his chemical lectures, during his long service as a professor in the Agricultural and Mechanical College of Kentucky and the other institutions with which he was connected, he lost no opportunity of showing the bearing of chemical science on the practice of agriculture, and it was in this way, perhaps, that his influence for the advancement of agriculture in his adopted state was greatest.

Peters, Richard. (Fig. 151.) By *G. F. Hunnicutt.*

Richard Peters, farmer, was born in Germantown, Pa., November 10, 1810. He died in Atlanta, Ga., on February 6, 1889. He came of a family prominent in the legal profession and in the army during the Revolutionary period. He studied civil engineering and went south in February, 1835, to assist in surveying the route of the Georgia railroad, a line running from Augusta to Atlanta and one of the first railroads to be built in the South. He was elected superintendent of this road, and was actively connected with railroad affairs all his life.

In 1847, Colonel Peters moved to Atlanta. Later he bought a farm of 1,500 acres in Gordon county, which he developed into the first noted stock-farm in the state. He spared no pains nor expense to secure the best breeds and types of cattle, and was a heavy importer. He tried each breed thoroughly, noting their good and bad

Fig. 151. Richard Peters.

points. He finally settled on Jersey cattle, Essex hogs, and Merino sheep as giving best results under the conditions in which he was working. His experience demonstrated that the live-stock business was a paying one. Colonel Peters' farm has remained for half a century a source for pure-bred cattle.

Besides his influence on the live-stock business, Colonel Peters was a horticulturist, and was among the first in Georgia to embark in the nursery business, starting a nursery in Atlanta in 1854. He gave the same energy to this as to the live-stock business, importing and experimenting with every variety of shrub or fruit he thought would suit the state. He also tried many varieties of grasses and feed-stuffs. To him is due a special measure of credit for spreading over the South the valuable sorghum plant.

Phelps, Lyman. By *E. S. Hubbard.*

Rev. Lyman Phelps, minister, horticulturist, a native of New York state, was born December 12, 1833. He died April 26, 1908. He was married three times, his third wife, Miss Mary Louise Blanie, to whom he was married January 17, 1900, still surviving him. He learned the cabinet-maker's trade when young. He finished his education in the Theological Seminary, at Nashotah, Wis., and was ordained in the Protestant Episcopal Church, at Oconomowoc, Wis., June 28, 1863. Because of ill health he went to Florida in the winter of 1875; afterward, did missionary work in Orange county, and for some time was rector of the Church of the Holy Cross at Sanford, Fla. He was appointed postmaster at Sanford, February 26, 1883. He was an originator of the Lyman Bank at Sanford, and director of the First National Bank at that place.

His horticultural work began after his second marriage, when he started an orange grove and was manager of General Sanford's Bellair grove of over one hundred acres, where he had the opportunity to test and select for cultivation a large number of varieties of citrus fruits, oranges and lemons. At his Onoro grove, near Sanford, and in connection with E. H. Hart, of Federal Point, he worked continuously at the selection and improvement of citrus fruits. He discovered the cause of bud sports, variations or so-called mutations of citrus fruits. Mr. Phelps was the "father" of complete chemical fertilizers for fruit-growing in Florida, and the materials and formulas he used are still the standards for securing the best results. He was an original member of the nurserymen's association that was reorganized into the old Florida Horticultural Society, and a charter member of the present Florida State Horticultural Society, of which he was chairman of the executive committee until failing health rendered him unable to fulfil its duties. He was an enthusiastic exhibitor at the fairs and expositions, and no variation or peculiarity of fruits seemed too small to escape his attention. A man of constructive imagination, his work deserved fuller recognition than circumstances permitted.

Philips, M. W. By *Alexander E. Cance.*

M. W., or "Log Hall," Philips, as he was familiarly known, farmer and agricultural writer, was born at Columbia, S. C., not long before 1809, probably not earlier than 1805. He died in 1889, at Oxford, Miss. He was graduated from the old South Carolina college, at Columbia. After graduation he studied medicine, spending two years at Philadelphia, Pa. He returned from Philadelphia in 1829 and settled in Mississippi in 1830, where he remained until his death. In 1836, he purchased a tract of land in Hinds county. Here he won fame as the sage of Log Hall. He raised fruit trees, sold them, wrote about them and enthusiastically urged his southern friends to raise fruit. In 1849, he had an orchard of forty acres with 300 varieties of peaches, apples, plums, apricots and other fruits. He was a successful cotton planter. He was a believer in good implements, and through his efforts and those of Thomas Affleck, new implements of improved sorts were introduced into Mississippi and exhibited at the Natchez fair. He wrote on Bermuda-grass and cowpeas, strongly advocating both, and was one of the first in his state to sow tame meadows. He was a stock-breeder and experimented with sheep-raising. He recognized the need of acclimating cattle and pointed out a means of preventing loss by death by importing in a different season and feeding properly.

Mr. Philips constantly advocated his views in the American Farmer, the Albany Cultivator, the American Agriculturist, the Southern Cultivator, Debone's Review, and many of the local papers, to which he was a prolific contributor. He began his journalistic career about 1832, and was a contributor to the Southern Cultivator up to the end of his life. From 1841–46, he was senior editor of the Southwestern Farmer, a weekly, published at Raymond, Miss. When Willis Gaylord, of the Albany Cultivator, died, he supplied his place as editor, until a successor was appointed. From 1868–72, he edited Philips' Southern Farmer, published at Memphis, Tenn.

During his life, Mr. Philips was actively identified with philanthropic and educational work. He was a member of the board of trustees of two Mississippi colleges, and, in 1872, was placed in charge of the newly created department of agriculture of the University of Mississippi. The department was not well supported and did not succeed, notwithstanding his earnest efforts. After the abandonment of the University farm, in 1876, Dr. Philips retired from active life, although he continued to write for numerous periodicals.

Pike, Nathaniel R. By *S. L. Boardman.*

Nathaniel R. Pike, farmer, secretary of the Maine State Pure Blood Jersey Cattle Association, was born in Fayette, Maine, December 8, 1815. He died in Winthrop, Maine, November 29, 1904, whither he went as a young man, and made his permanent home. He was associated with the history of Jersey cattle in Maine from the first. As they began to be brought into the state in large numbers, he recognized that an association of breeders was needed to protect their interests and a herdbook or record of purity of blood was necessary to establish the value of the individuals. March 7, 1870, he organized the Winthrop Jersey Cattle Association and commenced a herd register, which was kept in manuscript for several years. He continued his labors, unmoved by opposition which arose between the breeders of the Winthrop or Maine Jerseys and the breeders of animals of the American Jersey Cattle Club Registry, the latter maintaining that the former had not the necessary evidence of purity of blood to entitle them to recognition as a breed. Through persistence, however, all obstacles were overcome and the Maine Jerseys were established as a pure and distinct type. The local association, which Mr. Pike organized in 1870, became, in 1875, the Maine State Pure Blood Jersey Cattle Association, by an act of incorporation of the Maine legislature. In 1876, the first volume of its herdbook was published. The dates of the publication of the nine volumes of herdbooks edited by Mr. Pike are, respectively, 1876, 1880, 1883, 1886, 1889, 1892, 1895, 1898, 1901. The several volumes contained, in addition to the records of the animals, essays on various branches of the dairy business by Mr. Pike, and other information. In addition to his arduous duties as secretary of the association, Mr. Pike was a progressive, model farmer, conducting a large farm with success. He was a breeder of choice registered Jerseys, and a contributor to the agricultural press.

Piollet, Victor Emile. By *Georgie M. Piollet.*

Victor Emile Piollet, farmer, legislator, was born in Wysox, Pa., June 24, 1812. He died there on August 27, 1890. He was the son of Joseph Marie Piollet and Elizabeth Whitney Piollet. His educational opportunities were few, but he fitted himself for a life of usefulness in the school of experience. He became widely known as a successful farmer.

He was very active as a Granger, and was one of the organizers of the Grange in Pennsylvania. He was master of the State Grange for four years, lecturer for the same period, and served till his death on the executive board of the State Grange. He addressed Grange meetings in every county in his own state. In politics he was a life-long Democrat. He was a member of the State Legislature in 1846–7, and was paymaster in the army during the war between Mexico and the United States. At the time of his death, and for several years previous, he was a trustee of the Pennsylvania State College. Just prior to his departure for Mexico he was married to Miss Jane Miller, daughter of the Hon. Jesse Miller, secretary of the commonwealth.

Porter, John Addison. By *Wm. H. Brewer.*

John Addison Porter, educator, author, was born in Catskill, N. Y., March 15, 1822. He died in New Haven, Conn., August 25, 1866. He studied chemistry under Liebig, was an instructor in the Lawrence Scientific School, was the professor of chemistry applied to the arts at Brown University, and, from 1852 to 1856, succeeded Prof. J. P. Norton at Yale University as Professor of Agricultural and Analytical Chemistry. In 1856, Prof. Samuel W. Johnson succeeded him in charge of the agricultural chemistry. In 1860, those two men organized that most memorable course of agricultural lectures at New Haven, in which so many men, eminent in science and practical agriculture, took part.

Prince, John.

John Prince, horticulturist was born in 1770. He died August 13, 1843, at Roxbury, Mass. He was greatly interested in agricultural and horticultural progress. At one time he owned the finest gardens about Boston. He was one of the first to introduce from abroad large numbers of varieties of pears and other fruits. From its organization, Mr. Prince was an active member and trustee of the Massachusetts Agricultural Society.

Prince, William.

William Prince, second proprietor of the Prince nursery, at Flushing, L. I. (New York), was born about 1725. He died in 1802. The nursery, which was perhaps the first large commercial one in America, was established about 1730 by his father, Robert Prince. Every fruit of merit was imported, and the origination of new varieties by a careful selection of seedlings was enthusiastically prosecuted. Prince's Yellow Gage Plum was originated in 1783, and the Imperial Gage in 1794.

William Prince, third proprietor of the Prince Nurseries, at Flushing, was born November 10, 1766. He died April 9, 1842. During his lifetime the Prince Nursery was one of the centers of horticultural and botanic interest in America, and reached the height of its fame. He introduced to great popularity, the Lombardy poplar. In 1828, Mr. Prince wrote and published the Treatise on Horticulture, which was the first work of the kind produced in America.

William Robert Prince, fourth proprietor of the Prince Nursery, at Flushing, was born November 6, 1795. He died March 28, 1869. In 1830, he wrote, with the assistance of his father, the Treatise on the Vine. In 1831, he issued the Pomological Manual in two volumes. In 1846, he published the Manual of Roses. When the disease of the Irish potato caused a fear that it would have to be replaced by some other vegetable, he imported the Chinese Yam (*Dioscorea Batatas*). About the same time he introduced sorghum, or Chinese sugar-cane. He imported silkworms and mulberry trees, and was unwearied in his endeavors to promote silk-culture in the United States. [See biographical sketches in Cyclopedia of American Horticulture, pages 1435–1437.]

Quimby, Moses. (Fig. 152.) By *A. J. Cook.*

Moses Quimby, apiarist, was born April 16, 1810, in Westchester county, N. Y. He died May 27, 1875. While he was yet a boy the family moved to

Greene county, where he lived until 1853. He then moved to St. Johnsville, Montgomery county, and resided there until his death.

Mr. Quimby was of Quaker descent. He had no special school advantages, and was self-educated. At the age of twenty, he secured his first colony of bees, and soon became a most earnest student of bees and honey-production. He had a quick eye for the practical side of the business, and was exceptionally successful from the first. He read all the bee literature that he could procure. His book, Mysteries of Bee Keeping, did much in those early days to perfect the methods and make more successful the work of American apiarists. Perhaps no single individual ever did more for practical bee-keeping, if we except L. L. Langstroth.

Fig. 152. Moses Quimby.

Mr. Quimby possessed considerable inventive ability. The Quimby hive was not an infringement on the Langstroth hive, although its frame may have been suggested by that of Mr. Langstroth. He was also an earnest advocate of large hives, which are now favored by many of the ablest bee-keepers in the country. He organized the Northeastern Bee Keepers' Association, which exerted, fifty years ago, a telling influence among the bee-keepers of the northern states. He was long the president of this association, and was also one of the early presidents of the North American Bee Keepers' Association. He was for many years the able apiarian editor of The Country Gentleman, and was a frequent writer for other leading agricultural journals.

Rawson, Warren W. By *Herbert W. Rawson.*

Warren W. Rawson, market-gardener, was born in Arlington, Mass., January 23, 1847. He died August 9, 1908. He was educated in the schools of Arlington, Cotting Academy and Commercial College. He entered into partnership with his father in the market-gardening business in 1867, and in 1872 bought out the business, which he continued with success until his death. His plant is now the largest in New England devoted to market-gardening.

Reasoner, Pliny Ward. By *E. N. Reasoner.*

Pliny Ward Reasoner, nurseryman, was born at Princeton, Ill., May 6, 1863. He died from yellow fever, September 17, 1888. He was graduated with honors in his class at Princeton High School in 1880. He went to Florida in 1882, and started a nursery, the beginnings of the Royal Palm Nurseries, in 1883. He traveled extensively in Cuba, in 1886 and 1887, and collected plants and seeds. He was landscape-gardener and horticultural director in charge of the Sub-Tropical Exposition at Jacksonville, Fla., in 1888, and was one of the three commissioners representing Florida at the Cotton States Centennial Exposition, held in Cincinnati in that year. He was the author of Bulletin No. 1 of the Division of Pomology of the United States Department of Agriculture, on Condition of Tropical and Sub-Tropical Fruits in Florida and the Gulf States. His contributions to magazines and periodicals, devoted chiefly to horticulture, were very extensive.

Richmond, David Chester. By *C. E. Thorne.*

David Chester Richmond, farmer, legislator, was born at Westport, Conn., January 21, 1815. He died on his farm near Sandusky, Ohio, February 17, 1888, his wife surviving him for about four years. Before reaching his majority, he spent three years as a sailor, visiting China and other oriental countries. In 1837, he accompanied his father, a physician, to Erie county, Ohio, settling in Perkins township, near Sandusky. In the fall of that year he was married to Miss Sarah Burr, of Easton, Conn.

Colonel Richmond was an enthusiastic and successful farmer and fruit-grower. He was the originator and for many years the president of the Erie County Farmers' Club and Horticultural Society, an organization which did much to promote the interests of agriculture and horticulture in the county. He was one of the earlier members of the Erie County Agricultural Society, and was its president several terms. A clear thinker, a trained writer, and a ready speaker, he was for many years the recognized leader in the agricultural and horticultural interests of his county. Twice again he crossed the ocean, in 1860 and in 1876, visiting countries in Europe, Asia and Africa. He represented his county in the State Legislature during the four years, 1872–76. For several years he was a member of the State Board of Agriculture, and for a long period he was an active member of the State Horticultural Society. These two organizations, the State Board of Agriculture and the State Horticultural Society, have been in existence for more than half a century, and have been the rallying points for the most advanced thinkers in agriculture and horticulture from every quarter of the state. The two societies have been powerful factors in improving the conditions and unifying the interests of the farmers and horticulturists of the state.

Colonel Richmond was a conspicuous example of the influence which a man of ability and enthusiasm may exert in the uplifting of agricultural conditions in his neighborhood and in the state.

Riley, Charles Valentine. (Fig. 153.)
By *L. O. Howard.*

Charles Valentine Riley, entomologist, soldier, editor, was born near London, September 18, 1843. He died at Washington, D. C., September 14, 1895. He spent his early boyhood in England. His father was a clergyman of the Church of England, and died at an early age. On his mother's second marriage, Charles was sent to boarding school at Dieppe, France, at the age of eleven, and later to Bonn, Germany. At the age of seventeen he left school and came to America. He farmed for a while in Illinois, and then went to Chicago, where he did journeyman printing, drew portraits, acted as a reporter for one of the papers and finally became attached to the office of the Prairie Farmer, at that time the leading agricultural journal of the West. In 1864, he enlisted in one of the Illinois regiments and served to the close of the war, then returning to the agricultural editorial work. While still a mere boy, he became interested in the study of insects, and at the age of nine or ten commenced to keep notes and to make drawings of the different transformations of the English species. He had unusual artistic talent.

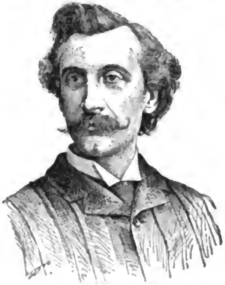


Fig. 153. Charles Valentine Riley.

While on the farm in Illinois, Riley's attention was first drawn to the damage which insects do to cultivated crops, and he subsequently owed his position on the Prairie Farmer to articles which he had written and handed in, in which he suggested new remedies for crop pests. As an attaché of this paper, he attended the meetings of the Illinois Horticultural Society, and made the acquaintance of Benjamin D. Walsh, a man of remarkable character and great ability, who in 1867 was appointed first State Entomologist of Illinois. Walsh exercised great influence on Riley's future. Together they founded and edited the American Entomologist. In 1868, when the state of Missouri passed a law providing for a State Entomologist, Riley was chosen to fill the place. He was now twenty-five years of age, and entered on his new duties with enthusiasm. Long before the completion of his series of nine annual reports, his name was known in all parts of the world as the foremost living economic entomologist. His ability as a delineator of insects was unsurpassed, and his reports from beginning to end were filled with pictures of insects of lifelike character and exact scientific accuracy. The field was almost entirely his own, and he made many discoveries of far-reaching practical and scientific importance. Toward the close of his term of office in Missouri, the disastrous outbreak of the Rocky Mountain locust or grasshopper in Kansas, Colorado and Nebraska attracted his attention, and in 1876, through his efforts, the United States Entomological Commission was founded by Congress and placed under the Interior Department, for the purpose of investigating this insect. This brought Riley to Washington, and two years later he was appointed entomologist of the Department of Agriculture to succeed Townend Glover. With the exception of an interval of two years, Riley held the position of entomologist to the Department of Agriculture from that time until June, 1894. The Entomological Commission was continued, and published bulletins and reports down to 1884.

In the Department of Agriculture, Riley was a leader. His interest in agricultural science extended beyond the boundaries of his own specialty. Possibly his greatest work in economic entomology consisted of his studies of the grape-vine Phylloxera, his work on the Rocky mountain locust or Colorado grasshopper, and that on the Colorado potato-beetle, but he published at length on the life histories and the remedies for many hundreds of insects. For his work on the Phylloxera he was decorated by the French government and was made an honorary member of many foreign societies.

He married, in 1878, Miss Emilie J. Conzelman, of St. Louis, who still survives. There are six children—one boy and five girls.

Robinson, Solon. By *John Lee Coulter.*

Solon Robinson, pioneer farmer, and writer, was born on a farm near Tolland, Conn., October 21, 1803. He died near Jacksonville, Fla., November 3, 1880, where he had spent the last ten years of his life. He attended the common schools, took up the carpenter's trade when fourteen, but soon gave it up because of ill health and migrated to the West, where we find him on the very frontier of civilization. He was prominent as a farmer in Lake county, Ind., during the thirties.

The first agricultural paper in the United States began to appear when Robinson was sixteen, and his interest in the agricultural awakening may be said to date from this time. From the West he contributed very largely for the various agricultural papers as they appeared. The Western Farmer, of Ohio, in the late thirties, and the Prairie Farmer, in the early forties, printed his articles extensively. But the greatest attention was attracted by his papers to the Albany Cultivator. In 1841, The National Agricultural Society was formed, and he was the recognized originator. The plan was to establish a great educational institution for farmers, and it was proposed to apply to Congress for the use of the Smithson fund, which had not yet been used for that purpose. He was an earnest advocate for state and county societies and for agricultural schools and colleges.

In 1842, the Allens, of New York, established the American Agriculturist, and Robinson became a regular correspondent. He now gave himself to the business of agricultural writing. By 1850, we find him living just outside of New York city and acting as agricultural editor of the Tribune, in which capacity he continued for a score of years. He was also associated with the Allens on the American Agriculturist. In 1852, he edited The Plow, a farm paper which succeeded the American Agriculturist. In 1853, he was associated with the Allens again in the publication of the Agricultor and the Farm and Garden—successors to The Plow.

In 1853, Robinson's book on Guano and Other Fertilizers, appeared; the next year, he published his Hot Corn, or Life Scenes in New York. How to Live, or Domestic Economy Illustrated, appeared in 1860; he then took up the preparation of his comprehensive work on American Agriculture; at the end of four years his work, Facts for Farmers and the Family Circle, in two volumes, was ready for the press. So extensive was the sale of this last work that, in 1867, it was revised and enlarged. Of Mr. Robinson's later writings, the most popular and the one which received the greatest circulation was Me-Won-I-Toc, A Tale of Frontier Life and Indian Character. (1867.)

Roe, Edward Payson. By *Byron D. Halsted.*

Edward Payson Roe, author, horticulturist, was born in New Windsor, Orange county, N. Y., March 7, 1838. He died in Cornwall, N. Y., July 19, 1888. He received his education at Williams College, but did not graduate, owing to an affection of the eyes. In after years, the college gave him the degree of B.A. He studied at Auburn and at Union Theological Seminary, New York city, and, in 1862, became a chaplain in the volunteer service. While pastor of a Presbyterian church at Highland Falls, N. Y., his lectures on topics connected with the Civil war first brought him into notice as a successful speaker. After visiting the ruins of the Chicago fire, in 1871, he wrote Barriers Burned Away, a novel published in the New York Evangelist, and afterward in book form. The great success of this book, together with impaired health, induced Mr. Roe to resign his pastorate and to settle at Cornwall-on-Hudson, in 1874, where he gave his time to literature and the cultivation of small fruits on an extensive scale. The latter soon brought him into notice as a grower, careful observer, and introducer of new varieties. Success with Small Fruits (1880) is a charming record of his horticultural operations. In Nature's Serial Story and Driven Back to Eden, his practical knowledge and literary skill are deftly used to picture life indoors and out among the Hudson Highlands. He was a prolific writer, and the sales of his books in this country alone have largely exceeded one million copies, and translations have been many in other countries. The following are conspicuous titles: Play and Profit in My Garden (New York, 1873); What Can She Do? (1873); Opening of a Chestnut Bur (1874); From Jest to Earnest (1875); Near to Nature's Heart (1876); A Knight of the Nineteenth Century (1877); A Face Illumined (1878); A Day of Fate (1880); His Sombre Rivals (1883); A Young Girl's Wooing (1884); Nature's Serial Story (1884); An Original Belle (1885); Driven Back to Eden (1885); He Fell in Love with His Wife (1886), and The Earth Trembled (1887).

Ruffin, Edmund. (Fig. 154.) By *W. H. Beal.*

Edmund Ruffin, pioneer in agricultural science in America, was born in Prince George county, Virginia, January 5, 1794. He died near Danville, Virginia, June 15, 1865. While Mr. Ruffin attained some prominence in the public affairs of his native state, his chief claim to distinction lies in the record of his active and intelligent effort to improve the agricultural conditions and methods of his day and section. He perceived that a fundamental essential to rural improvement was better education for agricultural pursuits. He suggested the establishment of a state agricultural college on a plan similar in many respects to that in operation in the agricultural colleges of the present day. He also advocated the appointment of a state commissioner of agriculture, and was instrumental in securing the organization of the Virginia State Agricultural Society, of which he was the first president. When the State Board of Agriculture was established by legislative act in 1841, Mr. Ruffin was elected a member and was afterward chosen secretary. From 1833 to 1842, he published, on his estate, the Farmers' Register, a

Fig. 154. Edmund Ruffin.

monthly agricultural journal of high character and great local influence. An unsuccessful attempt to apply on his own estate the methods of soil improvement advocated by John Taylor in his "Arator," published in 1813, led Mr. Ruffin to take up the most notable feature of his life's work, viz., the action of calcareous manures on soils. Certain passages in Sir Humphrey Davies' Lectures on Agricultural Chemistry suggested to him the idea of soil acidity, a condition, he argued, which could be corrected by the use of calcareous manures. He immediately put his theory to practical test by beginning, in 1818, a long series of experiments with marl, of which abundant deposits were available for the purpose in the region. The first account of these experiments appeared as An Essay on Calcareous Manures (7 pages), published in the American Farmer in 1821. This essay was afterward published in book form, which reached the fifth edition in 1852, and is one of the most thorough treatises on a special agricultural subject in the English language. The third edition of this essay was published as an appendix of the Farmers' Register in 1842 (as were also Arator in 1840 and the Westover Manuscripts in 1841–42). Other more important agricultural writings of Mr. Ruffin were collected and published in 1855 under the title of Essays and Notes on Agriculture. One of the most important articles in this collection, which covered a very wide range of subjects, is a prize essay on the Southern Pea (cowpea), which is remarkably complete and accurate. An essay on agricultural education, which won a prize offered by the State Agricultural Society, was published in 1853. Although most of the practical methods advocated by Mr. Ruffin have long since fallen into disuse, his teachings exerted a very beneficial influence in his day and he advanced many ideas on which sound practice is based at the present time. [For further details of Mr. Ruffin's life and services, consult "A pioneer in Agricultural Science," by W. P. Cutter, Yearbook, United States Department of Agriculture, 1895, pp. 493–502.]

Fig. 155. Jeremiah McLain Rusk.

Rusk, Jeremiah McLain. (Fig. 155.)

Jeremiah McLain Rusk, Secretary of Agriculture, was born June 17, 1830, in Morgan county, Ohio. He died near Viroque, Wis., November 21, 1893. His parents were Daniel and Jane Fakner Rusk. He was reared on the farm and educated in the schools of the vicinity. In 1849, he married Mary Martin, of Ohio. She died in 1858, leaving three children. He married again, Miss Elizabeth Johnson, by whom he had two children. In 1853, he took a farm in Bad Ax (now Vernon county), Wis. Here, as in Ohio, he became a stage driver. In 1855 he became sheriff of his county, in 1857, coroner, and in 1861 was elected to the state legislature. In 1862 he joined the army as Major in a volunteer regiment he had organized, and served with distinction throughout the war. In 1865 and again in 1867, he was chosen state bank comptroller. In 1870, he was elected to Congress by a large majority, and served several terms. In 1881, he was elected governor of Wisconsin, and was three times reëlected. In this position he was active in advancing the farming interests of his state and in organizing farmers' institute work. In 1889, under President Harrison, he became Secretary of Agriculture, which position he filled with the same distinction and success that had characterized his other public offices.

Sanders, James Harvey. (Fig. 156.)
By *A. H. Sanders.*

James Harvey Sanders, editor, was born on a farm in Union county, Ohio, in 1832. He died in Nashville, Tenn., December 22, 1899. His ancestry was Virginian. In 1852, he went west to Keokuk county, Iowa, where he became a teacher in the country schools. After his marriage he was elected secretary of the Iowa state senate, and, subsequently, county clerk. He moved to the county seat, Sigourney, settled on a country place nearby, and entered the banking business. He also secured control of the Sigourney News. He then purchased the best live-stock available. He delighted in the study of the various problems of heredity, then practically unstudied in the western country. He gave much attention to breeding the draft horse, and studied enthusiastically the increase of speed in the American trotter.

Mr. Sanders established the Western Stock Journal, at Sigourney, in May, 1869, the first live-stock paper ever published. Its reputation soon extended beyond its local field, and, in 1870, it was consolidated with the National Live Stock Journal, which had been started a few months before in Chicago. In the interim, Mr. Sanders had become involved, financially, in a railway project in Iowa, and the panic swept away his fortune. He then went to New York to assume the editorship of the Spirit of the Times, the leading journal devoted to turf matters. A year later he purchased a half-interest in the National Live Stock Journal, and remained its editor until 1881. In the latter year, he established the Breeders' Gazette, in Chicago. The ownership and management of that journal are now in the hands of his son, the lines of its conduct being substantially the same as those originally mapped out by its founder. In 1888, the elder Sanders was commissioned by Hon. J. M. Rusk, then Secretary of Agriculture, to undertake a special mission abroad in behalf of the Government.

Fig. 156. James Harvey Sanders.

Mr. Sanders was the author of two books, Horse Breeding and The Breeds of Live Stock. Both were standard works and were used as text-books in the agricultural schools of many states. Mr. Sanders was a member of the historic Treasury Cattle Commission, which investigated the health of the foreign herds from which our supplies of imported breeding animals were drawn. This commission also devised the system of quarantine which the United States has since employed so effectively in keeping out infectious diseases of domestic animals. He was among the earliest advocates of the establishment of pedigree records for pure-bred stock, and took an active part in the starting of studbooks for the various breeds.

As a journalist, Mr. Sanders stood for the truth. His energy was illimitable; his nature was kindly and courteous.

Saunders, William.

William Saunders, horticulturist and landscape-gardener, was born at St. Andrews, Scotland, in 1822. He died at Washington, D. C., September 11, 1900. His most important landscape work was in planting and laying out the Gettysburg Cemetery. He introduced plants from all over the world, one of his most important introductions being the navel orange. As early as 1855, he was actively engaged in an effort to organize an association of farmers, and this work eventually resulted in the formation of the Grange, of which he is often called the father. [See biographical sketch in Cyclopedia of American Horticulture, page 1617.]

Shaw, Henry.

Henry Shaw, founder of the Missouri Botanical Garden, was born at Sheffield, England, July 24, 1800. He died at St. Louis, Missouri, August 25, 1889. In 1849 he laid out a modest garden about his country home in the suburbs of St. Louis, which, nine years later, he extended so as to include some forty-five acres, about half of this area constituting an arboretum. By an act of the General Assembly of the state, he was empowered to provide for the conveyance of his property to trustees for perpetual maintenance as a scientific establishment. On his death, he left property, valued at about $5,000,000, to a board of trustees for the maintenance, improvement and enlargement of the Missouri Botanical Garden. In 1885, he endowed a department in Washington University, known as the Henry Shaw School of Botany. [Biographical Sketch in Cyclopedia of American Horticulture, page 1663.]

Skinner, John Stuart. By *John Lee Coulter.*

John Stuart Skinner, father of the American Agricultural Press, for thirty-two years a prolific contributor to the agricultural literature of the United States, was born in Maryland, February 22, 1788. His death, resulting from an accident, occurred on March 21, 1851. Until early manhood he lived on the farm. In 1809 or 1810, he began law practice, but abandoned it to accept a special commission under appointment of President Madison, concerned with the handling of the ocean mails. He was soon appointed agent for prisoners of war, and a little later (1813) was engaged in the department of the navy. When the war was at its height and the British forces were moving toward Washington, it was young Skinner who rode ninety miles in a night and first announced their approach. The British retaliated by burning the buildings on his St. Leonard's Creek estate, for which loss he never sought remuneration from the government. Shortly after the war, Mr. Skinner, who had moved to Baltimore in 1812, was made postmaster of that city and continued in that capacity for many years. He was later made Assistant Postmaster General of the United States.

On April 2, 1819, Mr. Skinner established The American Farmer at Baltimore. This was the first farm paper in the United States and was a weekly of eight quarto pages. The contents of the new paper were to be "Rural Economy, Internal Improvements, News, Prices Current;" and an editorial announcement says that "The great aim, and the chief pride, of the American Farmer, will be to collect information from every source, on every branch of Husbandry, thus to enable the reader to study the various systems which experience has proved to be the best under given circumstances, and in short to put him in possession of that knowledge and skill in the exercise of his means, without which the best farm and the most ample materials will remain but so much dead capital in the hands of their proprietor." For fifteen years he guided the American Farmer. In 1834, the paper passed into the hands of E. P. Roberts, and was called the Farmer and Gardener for five years. In 1839, Mr. Skinner again took charge, and the American Farmer, new series, still a weekly eight-page quarto, appeared and continued to be published as such until it passed under the control of Samuel Sands, who changed it, in July, 1845, to a thirty-two page monthly. Prior to 1845, Mr. Skinner had edited other prominent papers, the most important of which were the American Turf Register and Sporting Magazine, which was issued for ten years as a monthly journal. He was also editor of the monthly Journal of the American Silk Society and Rural Economist during the late thirties and early forties, when the silk fever was at its height and the *Morus Multicaulis* episode took place. His more important published works prior to 1845 were Guenon on Milch Cows, with an introduction which shows a very extensive practical knowledge; Christmas Gifts to Young Agriculturists, in 1841, and Letter on Nautical Education in the same year. In 1844, appeared Every Man His Own Cattle Doctor, and Youatt on the Horse, and in 1845, The Dog and Sportsman.

In July, 1845, at the age of fifty-seven, Mr. Skinner became associated with Greeley and McElrath of the New York Tribune, as editor of The Farmers' Library and Monthly Journal of American Agriculture. The publication was to be at least 1,200 pages the year, and was to cost $5. The Journal of Agriculture was a pronounced success from the start, and by July 1, 1846, the first volume of the Farmers' Library had been presented to the public. It was Albrecht Daniel Thaer's Principles of Agriculture. His next effort was a two-volume adaptation of Stephens' Book of the Farm to American conditions. During the next two years, the more important contributions edited included Peizhold's Lectures on Agricultural Chemistry, Dumas' Essay on Nutrition of Plants, and Randall's Essay on Sheep. In July, 1848, Mr. Skinner entered on the final work of his life. Moving to Philadelphia, the Pennsylvania Society of Agriculture gave him the free use of their rooms for the publication of The Plough, the Loom and the Anvil. Although scientific production and problems of local farm management were accorded their proper place and given careful attention, Mr. Skinner presented to the reading public, month after month, the best articles then written on the economics of agriculture and the allied industries,—those closely related to the loom and the anvil. During these years he published Agriculture for Common Schools.

Smart, James Henry. By *W. E. Stone.*

James Henry Smart, educator, was born at Center Harbor, New Hampshire, June 30, 1841. He died February 21, 1900. He attended Dartmouth College, and at eighteen years of age became a public school teacher. In 1865, he became superintendent of schools at Fort Wayne, Indiana, and in 1874 he was elected State Superintendent of Public Instruction, in which capacity he served three successive terms. In 1883, he was made president of Purdue University, and held this position until his death. He became an ardent advocate of technological training, which found expression in the development of the institution of which he was president. He was active in the work of the American Association of Agricultural Colleges and Experiment Stations, of which he was president in 1890, and was appointed Commissioner for the United States to the Agricultural Congress at The Hague in 1891. In the early development of the ideas which have become characteristic of the Land-Grant colleges of the United States, he was an important factor, working unremittingly for the recognition of the "new education" and the application of scientific methods to the industries.

Smith, Frederick Hart. By *H. R. Smith.*

Frederick Hart Smith, farmer, legislator, was born in Bethel, Conn., December 14, 1834. He died in Somerset, Mich., December 18, 1900. When he was but four years old his father, Azariel Smith, removed his family to Hillsdale county, Michigan, then on the frontier. Frederick spent all his life in farming. He acquired a state-wide reputation as a cattle-feeder. As an ardent lover of fine stock, and with an unusual display of skill as a judge and feeder of farm animals, he exerted a marked influence in the betterment of farm stock in Michigan. As a member of the Michigan Agricultural Society, which had control of the Michigan State Fair, and as a legislator, his efforts were constantly directed toward agricultural improvement.

Smith, Hiram. By *H. H. Wing.*

Hiram Smith, farmer, was born in Tinicum, Bucks county, Pa., February 19, 1817. He died May 15, 1890. His parents moved from Pennsylvania to northern New York in 1820. On March 20, 1845, he married Catharine Conover, by whom he had two children. From New York Mr. Smith emigrated to Wisconsin in 1847, settling with his brother and some other members of the family near Sheboygan Falls. He engaged in farming with marked success, and soon turned his attention more particularly toward dairying. He early saw the need of education and coöperation among farmers along these lines, and was instrumental in organizing the Sheboygan Falls Board of Trade, of which he became president in 1872. He was president of the Wisconsin Dairymen's Association 1875–77, and for two years was president of the Northwestern Dairymen's Association. He was elected a member of the Assembly in 1871.

Mr. Smith had already done much toward stimulating a desire among farmers in education along dairy lines, when he was appointed a regent of the University of Wisconsin in 1877. As chairman of the farm committee of the Board of Regents at this institution, he was largely instrumental in the organization of the Department of Agriculture, out of which soon grew the College of Agriculture. He was largely instrumental in organizing the State Experiment Station at the University of Wisconsin. The dairy building on

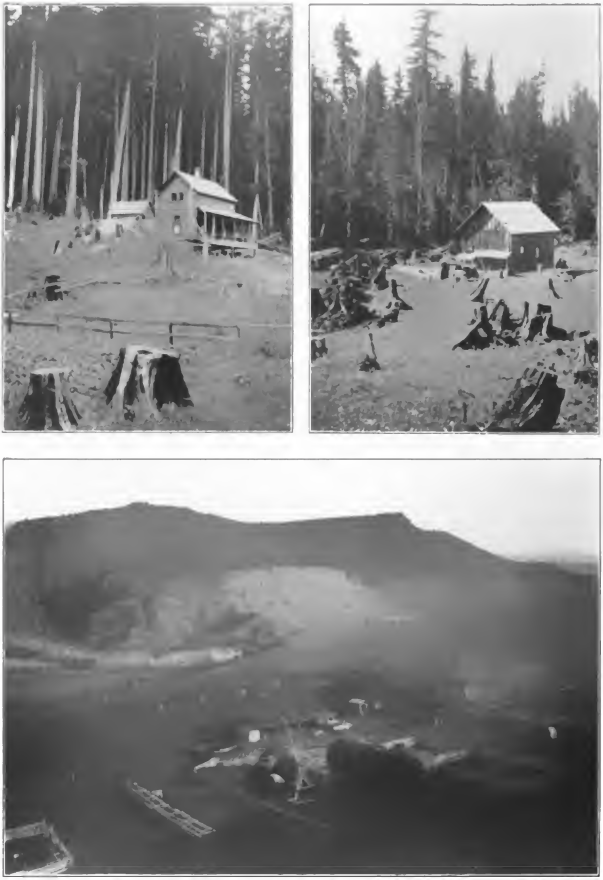


Plate XXV. Pioneer farm homes in the West. Washington

the grounds has been named Hiram Smith Hall, in his honor. Two features of agricultural instruction, namely, the short winter-courses for farmers' boys and farmers' institutes, both of which are now recognized as important branches of agricultural education, were early developed, and soon attained a prominent position in the state of Wisconsin, and it was largely through the efforts of Mr. Smith that this was done.

Smith, James. By *Charles A. Keffer.*

James Smith, pioneer nurseryman and fruit-grower of Iowa, was born in Simpson county, Kentucky, August 17, 1810. He died in 1892. His parents, John and Elizabeth Bradford Smith, were natives of North Carolina. His education was received in a private school and he enjoyed unusual advantages in boyhood, his father being a prominent planter. He was essentially a pioneer, emigrating first to Fulton county, Illinois, in 1834, thence to Polk county, Iowa, in 1847, and finally, at the age of seventy-three, to the frontier settlement of Edmonds county, South Dakota, in 1883. During his residence in Iowa he became the leading nurseryman and fruit-grower of the state, having seven different nurseries in as many counties. He planted a large apple orchard at his homestead in the southern limits of Des Moines, and supplied dealers throughout the central part of the state with fruit. At the Centennial Exposition at Philadelphia his exhibit of apples won a first prize for collection. He was awarded the Wilder Silver Medal by the American Pomological Society.

The encroachments of the city on his homestead led him to emigrate to Edmonds county, South Dakota, with his wife and daughters and an orphan granddaughter. Here he took homesteads, preemptions, and tree claims for himself and children, and did a great pioneer work with forest trees and hardy fruits. Desiring better educational facilities for his granddaughter, he removed to Brookings, South Dakota, in 1889, and in his new home planted trees and fruits with the enthusiasm of a young man. In Brookings, his long experience and extensive knowledge made him a most helpful advisor to the Horticulturist of the State Experiment Station. He was twice married, and was survived by two sons and three daughters.

Mr. Smith was a man of the strictest integrity, and to the end of his long life he was always occupied in some productive industry. He demanded of his business associates and friends the same high ideals that controlled his own actions, and by many he was regarded as eccentric. In unobtrusive ways he was a philanthropist, but publicity of any kind was distasteful to him. He was a positive factor in the development of horticulture in the West.

Stanford, Leland. By *J. M. Stillman.*

Leland Stanford, farmer, lawyer, statesman, merchant, philanthropist, was born March 9, 1824, at Watervliet, Albany county, N. Y. He died June 21, 1893, at Palo Alto, Cal. He was the fourth of seven sons of Josiah Stanford, who married a Miss Phillips. His boyhood was spent on his father's farm, attending the local schools, later completing his education at the academy at Clinton and the Cazenovia Seminary. In 1845, he went to Albany, entering the law offices of Wheaton, Doolittle and Hadley; in 1848, was admitted to the bar, and established himself in practice at Port Washington, Wis. In 1850, he married Jane Lathrop, of Albany. The destruction, by fire, of his law offices and library at Port Washington, 1852, determined Mr. Stanford to go to California, where three of his brothers were already established in mercantile business.

In California, Mr. Stanford engaged in mercantile business at Michigan Bluff, later in Sacramento. In 1860, he was delegate to the National Republican Convention, and in 1861 was elected governor, thus becoming the war-governor of California. In the same year he was one of the incorporators of the Central Pacific railroad, of which he was first president, a position he held until 1885. In 1885, he was elected senator from California, an office which he held until his death.

The death of their only son, Leland Stanford, Jr., in 1884, determined Mr. and Mrs. Stanford to devote practically their whole fortune to the foundation, as a memorial, of the Leland Stanford Junior University, and to this object the attention of Mr. Stanford, and after his death, that of his wife, was largely directed. The grant of endowment was signed November 11, 1885, and the university opened for instruction October 1, 1891, under the presidency of David Starr Jordan.

In the deed of trust of the new university, Mr. Stanford stated, among other objects of the foundation, that it shall include "all things necessary for the study of agriculture in all its branches."

Mr. Stanford's early training and experience gave him a deep interest in agricultural affairs, which found expression, as his fortune permitted, in the ownership and administration of several large farm properties. The Gridley ranch, Butte county, 22,000 acres, was mainly a wheat ranch. The Vina ranch, 55,000 acres, Tehama county, about 4,000 acres in vines, was the field of many experiments in wine-growing and making. On the Palo Alto ranch, Santa Clara county, 7,500 acres, was his country home, and the celebrated stock-farm where the improvement of the trotting horse was Mr. Stanford's particular interest. Many noted horses were developed here—Electioneer, Palo Alto, Electricity, Arion, Sunol, being among the best known. It was here that Eadward Muybridge, at Mr. Stanford's instigation and at his expense, elaborated his method of studying the motion of animals by instantaneous photography. The results of these and other studies on the paces of the horse, were printed under Mr. Stanford's auspices in the Horse in Motion.

On the Palo Alto ranch, now the university campus, is also the Arboretum, where, with coöperation of prominent botanists, notably Dr. Chas. C. Parry, a great variety of foreign and domestic trees and shrubs were planted to test their adaptability to local climate and conditions. Many experiments in agricultural lines, not under his own direction or on his own property, were assisted by Mr. Stanford.

Stayner, Arthur. By *J. C. Hogenson.*

Arthur Stayner, sugar-beet grower and manufacturer, was born on March 29, 1835, at St. Peters Port, Guernsey, Channel Islands. He died on September 4, 1899, in Salt Lake City, Utah. He was an accomplished gentleman, having been educated in England for the ministry. His training in the classics was thorough, and he was master of several of the modern languages. He went to Utah in company with his parents at the age of eighteen years, and was always a worker for the public welfare. The main part of his life was devoted to the sugar industry of the state of Utah. He gave to its promotion nearly all his time, his ability and his money, and has been aptly called the father of the sugar industry of this state. He made the first cane-sugar manufactured within the state of Utah on his own premises at Farmington, Utah, at his own expense. He was the original promoter and organizer of the Utah Sugar Company. In the last few years of his life he turned his efforts to the production of canaigre root, which is used in leather tanning, and he was an active member of the Utah Guano Company. His chief aim in life seemed to have been to promote home industry.

Stelle, J. Parish. By *J. F. Duggar.*

J. Parish Stelle, educator, author, scientist and agriculturist, was born in Illinois about 1828. He died September 26, 1893, in Mobile, Ala. He was educated as a physician. He then became a reporter on the Louisville (Kentucky) Journal. In 1869, he became connected with the Mobile Register, Mobile, Alabama. As agricultural editor of this paper, a place he filled for the greater part of twenty-four years, he made his most important contributions to southern agriculture. Among the subjects to which he gave special attention in those columns were the following: Advocacy of pecan-culture and of Cuban cigar tobacco-culture in the southern states, both of which practices have been successfully adopted; demonstration, on his own farm, that upland rice may be successfully grown without irrigation; recommendations relative to commercial fertilizers; advocacy of meat-production on southern farms; the botany and cultivation of the cowpea; advocacy of boring, along the Gulf coast, wells for artesian water, which measure, when executed in later years, was thoroughly successful. He conducted his farm largely as a means of making demonstrations or experiments. He made a special study of entomology, and is credited with being the first to advocate the use of Paris green as a means of destroying the cotton caterpillar. He spent some time in Mexico connected with the Entomological Commission sent into that country by the United States government. He was also employed by the Mexican Central railroad as an expert to locate sites for the boring of artesian wells along the line of that road.

This versatile man had also a mechanical turn, and in his earlier years wrote a book on firearms and watch-making, which had an extensive sale. Personally, Dr. Stelle is described by those who knew him as a man of excellent character, quiet, honest, modest, persevering, simple-hearted and animated by a strong desire to be useful.

Stephens, George. (Fig. 157.) By *G. A. Stephens.*

George Stephens, millwright, farm-implement maker, was born in Westmoreland county, Pa., February 22, 1819. He died at his home, Moline, Ill., in his eighty-fourth year. He learned the millwright's trade during his boyhood. He left home on the morning of his twenty-first birthday, went westward, and built mills in the western part of Pennsylvania, Ohio and Illinois. Having got sufficient money to undertake the erection of a mill for himself, he built a grist-mill on Rock river, which the high water of the succeeding spring took away. Having lost all, he went to Moline, Ill., and built a mill for Sears, Wood & Huntoon. When finished, they were unable to pay him, and Mr. Sears gave him his part of the mill, he retiring to other interests which he had in hand. The firm was then Stephens, Wood & Huntoon. Mr. Stephens brought into the firm brains, pluck and energy, and from his advent the business became successful. This firm did an extensive business in the manufacture of lumber and furniture until the United States government took possession of their property in the fall of 1865, at which time the island was converted into a military reservation. In the spring of 1866, Mr. Stephens became a stockholder in Candee, Swan & Co. In 1870, this firm was changed into and incorporated under the Moline Plow Company. Mr. Stephens was made vice-president, which position he held until 1892, when he became president. He continued at the head of the firm until his death.

Fig. 157. George Stephens.

Stevens, John Harrington. By *Andrew Boss.*

John Harrington Stevens, soldier, farmer, editor, credited with being the first white settler in what is now the business center of Minneapolis, Minn., was born June 13, 1820, in Canada, although his ancestors were New Englanders. He died May 28, 1900. He was the second son of Gardner and Deborah (Harrington) Stevens. He was married May 1, 1850, to Frances Helen Miller of Westmoreland, New York.

In 1842, Stevens moved to Illinois, where he received additional educational advantages in the public schools. He served throughout the Mexican War, and a year or two after its close emigrated to Minneapolis. He formed a business partnership with Franklin Steele, a storekeeper in the village of St. Anthony, but later took up a farm on the west bank of the Mississippi, on the site of the present city of Minneapolis, and the great flour-milling district. Colonel Stevens took a lively interest in the development of the city and of the country west of it. His public spirit and energy were honored by his election to various public offices, both county and state. He was influential in organizing agricultural and horticultural societies and retained a lively interest in them until they were on a substantial and permanent basis. He was the first man to bring pure-bred stock into the state, and for many years managed one or more farms in close proximity to Minneapolis. He was honored with the presidency of the State Agricultural Society, and was a member and president of the State Horticultural Society. Dignified, courteous and gentlemanly, he made the friendship of immigrants, hunters and explorers, and during its territorial stage was one of the foremost in attracting settlers and developing the agricultural resources of the state. During the Indian uprising, Colonel Stevens was called on to command the troops and volunteers sent to the front. He served the state in many similar ways and seemed, while physically able, to be always in public demand. He gained a reputation as a writer, also, and was the owner or editor of a number of papers. Among them are several weekly local papers; the Farmer and Gardener, and The Farmers' Tribune. He was for three years agricultural editor of Farm, Stock and Home, Minnesota's oldest agricultural paper.

Stiles, William Augustus.

William Augustus Stiles, journalist, editor and park commissioner, was born March 9, 1837, at Deckertown, N. J. He died October 6, 1897, in Jersey City, N. J. He was an editorial writer of the New York Tribune. In 1883, he became agricultural editor of the Philadelphia Press. On the founding of Garden and Forest in 1888, he was invited to become managing editor, which position he held until his death. In 1895 he was appointed a park commissioner of New York City, and rendered signal and valuable service. He rendered conspicuous service in working for the establishment of small parks easily accessible to the poor. [See biography in Cyclopedia of American Horticulture, page 1724.]

Stockbridge, Levi. (Fig. 158.)
By *H. E. Stockbridge.*

Levi Stockbridge, farmer, educator, legislator, investigator, was born in Hadley, Mass., March 13, 1820, of Puritan stock. He died May 2, 1904. His schooling was confined to the public schools and old-time country academies. While working on his father's farm, he kept up with the first year's work of his brother in Amherst College. He afterward attended several courses of lectures there, particularly those on geology and chemistry.

Fig. 158. Levi Stockbridge.

Levi Stockbridge exerted influence on agriculture as a progressive farmer, as a public official, as teacher of agriculture, as scientist and investigator. He was president of his county agricultural society, and for twelve years member of the state board of agriculture. He was largely instrumental in causing the legislature to accept the provisions of the Morrill law creating the Land-Grant colleges. He was active in prevailing on the legislature to incorporate an independent agricultural college. As chairman of the committee on agriculture of the state senate in 1865 and 1866, he was instrumental in securing the legislation under which the institution was opened to students in 1867. Afterward, while connected with the college, he was several times member of the legislature from which he was active in securing appropriations for the college. In 1883, he introduced the bill making an annual appropriation of $10,000 to be used as a labor fund in the assistance of worthy students For thirty years he was chairman of the state commission on livestock sanitation. In 1867, he became the first instructor, later professor, in agriculture in the new college. He was three years acting president, and two years president of his institution. The Massachusetts Agricultural Experiment Station was originally founded on a gift of $1,000 made by him to the trustees of the Agricultural College, in January, 1878, for that purpose.

As an investigator, Mr. Stockbridge was best known for experiments in plant-feeding and the system of practical crop-fertilizing developed therefrom, and for his theories regarding dew in relation to plant moisture, and soil-cultivation to conserve moisture. He proposed fertilizer formulas widely used and known as the "Stockbridge Manures." The principle he enunciated was to discard the composition of the soil and adopt the composition of the crop to be grown as the basis for fertilizing. The Stockbridge theory and formulas revolutionized the thought and practice of crop-fertilizing. Plant-food, instead of soil-manuring, became the basis of thought and practice. His investigations on rainfall led him to announce the theory that plants receive no appreciable moisture from the air in the form of dew; that dew on vegetation is not condensed atmospheric moisture, but is soil-evaporation and plant-exhalation condensed by the colder surrounding atmosphere. This conclusion was supported by the fact that, at the time of the deposition of dew, the temperature of the air is colder than that of either soil or plant. Further, plants weighed when covered with dew were lighter than before dew began to form. He also announced the principle that changed the practice of soil cultivation. In explanation of his experimental results he said: "The place of waters evaporated from the surface is continually supplied from the deeper soil by capillary action. The water moves upward in fine tubes formed by the particles of soil; if the soil is compact, as when beaten down by rain, the tubes are perfect and the water moves upward to the surface rapidly; but if the tubes are broken up, the soil particles being separated by cultivation, the subsoil water must rise slowly. The lesson is, cultivate the land to save crops from the dire effects of drought." This was the beginning of the present common practice of shallow cultivation, or the "dust mulch," for the conservation of soil water.

Sturtevant, Edward Lewis. (Fig. 159.)
By *H. H. Wing.*

Edward Lewis Sturtevant, farmer, investigator, executive, was born in Boston, Mass., January 23, 1842. He died at his home in South Framingham, Mass., July 30, 1898. Left an orphan at an early age, his boyhood was spent with an aunt at Winthrop, Maine. At seventeen years of age, he entered in the class of 1863 at Bowdoin College. In his senior year, he withdrew and enlisted in Company G., of the Twenty-fourth Maine Volunteers. He was soon appointed first lieutenant, and afterward captain, and served until the close of the war. He was later given the degrees of B.A. and A.M. by Bowdoin College, and entered Harvard Medical School. He was graduated from there with a degree in 1866, but never entered on the active practice of medicine.

In 1867, with his brothers, Joseph and Thomas, Edward purchased a farm near the village of South Framingham which was called Waushakum Farm. He here became an active breeder of Ayrshire cattle, and established a herd that was noted for its milk-production. He was instrumental in establishing the North American Ayrshire Register, which was afterward incorporated with the Ayrshire Herdbook. Doctor Sturtevant also improved, by selection and culture, a variety of yellow flint corn that afterward became widely known and celebrated as Waushakum corn. He established an improved variety of muskmelon known as the New Christiana. He was engaged in very many matters of a more or less experimental nature, being particularly interested at this time with the physiology of the secretion of milk, in drainage, and in the percolation of moisture through soil. The first lysimeter built in America was established at Waushakum Farm in 1875. Almost from his first connection with Waushakum Farm, Doctor Sturtevant was an active contributor to agricultural periodicals and a frequent speaker before gatherings of farmers and dairymen.

Fig. 159. Edward Lewis Sturtevant.

In 1882, Doctor Sturtevant was made the first director of the New York State Agricultural Experiment Station at Geneva, and perhaps did his greatest work for agriculture in the organization of that station. The station at Geneva was the first in the United States to attempt anything more than seed and fertilizer control, and the broad lines of work that he inaugurated there were largely followed in the later stations established under the so-called Hatch Act in 1887. Doctor Sturtevant's own work at Geneva was largely concerned with the history and development of agricultural and horticultural varieties of cultivated plants, and his monograph on corn is one of the most noteworthy features of the reports of that station. In 1887, he resigned the directorship of the station and, having abundant means, retired to his home at South Framingham, where the remainder of his life was devoted to his favorite studies in the history of the development of cultivated plants. To this end, he gathered together a very valuable library comprising many rare and valuable botanical works of the Prelinnæan era. This library is now the property of the Missouri Botanical Garden at St. Louis, and is known as the "Sturtevant Prelinnæan Library." He was also editor of the Scientific Farmer, from March, 1876 till October, 1879. This journal, however, was rather in advance of the times and was not a financial success.

Sullivant, Joseph. By *C. E. Thorne.*

Joseph Sullivant, scientist and educator, was born in Ohio, December 3, 1809. He died June 24, 1882. He was the son of Lucas and Sarah Starling Sullivant. He was educated in the first classical schools established in Columbus; in a boarding-school at Worthington, Ohio; at Ohio University (Athens) and at Center College, Ky. At an early age he developed a taste for the natural sciences, which was stimulated by his father, and he entered on a regular course of scientific study. Before he had reached his majority he was appointed by the legislature one of the incorporators of the Philosophical and Historical Society of Ohio, of which for several years he was corresponding secretary and curator. For forty years he took an active part in the organization and management of literary societies in Columbus, and frequently lectured on scientific tropics before the associations of the city. He was an active member of the Columbus Board of Education for twenty years, and as a testimonial to his work the largest and finest school building in Columbus was named the Sullivant School. Mr. Sullivant was for many years a member of the Ohio State Board of Agriculture, and was one of the first board of trustees of the Ohio Agricultural and Mechanical College, the Land-Grant institution of Ohio, now the Ohio State University.

Mr. Sullivant was married three times. His first wife was Margaret Irvin McDowell, daughter of Col. Joseph McDowell, of Danville, Ky. His second wife was Mary Eliza Brashear, granddaughter of Judge William McDowell and Peggy Madison, sister of James Madison, President of the United States. His third wife was Elizabeth Underhill, a descendant of Captain Sir John Underhill, who figures in the annals of New England.

With his great interest in scientific education on the one hand, and in agriculture on the other, it would be expected that Mr. Sullivant would take a lively interest in the application of science to agriculture. He made experiments in the feeding of live-stock, which he published in pamphlet form, and while connected with the Agricultural and Mechanical College he took a deep interest in the agricultural side of its work. He lived at a time when agricultural education and investigation were in the transitory stage between chaos and system, and was not permitted to witness the triumph of his ideals; but he was one of those to whom it was given to see with prophetic vision the possibility of what we are realizing today.

Swan, Robert K. By *G. A. Stephens.*

Robert K. Swan, farm-implement manufacturer, was born in Huntington county, Pa., July 19, 1825, where he was brought up as a farmer. He died at the age of fifty-three at his home in Moline, Ill. He received his education in a log schoolhouse. At the age of fourteen, he came with his father and family to Preble county, Ohio. In 1857, he reached Moline, Ill., penniless. He began work for Alonzo Nourse, a manufacturer of fanning mills, which he undertook to sell, traveling with these mills in a wagon, selling as many as possible in the summer and collecting for them in the winter. He continued this effort for two years most successfully, at the end of which time he embarked with Henry W. Candee in the manufacture of chain pumps and hay rakes, and continued in that business until 1865, when they took into partnership Mr. Andrew Friberg, the firm being then called Candee, Swan & Co., at which time they began to make plows. The next year, Mr. George Stephens was taken in as a partner, and in 1870 the firm was incorporated into the Moline Plow Company. Mr. Swan was general traveling agent until 1875, at which time he became president of the company, which office he held until his death. Mr. Swan was a man of very great energy and perseverance.

Taylor, John. By *Alexander E. Cance.*

John Taylor, statesman, pamphleteer, author and agriculturist, was born on a plantation in Orange county, Va., in 1750. He died in Caroline county, Va., August 20, 1824. His parents were comfortably situated, and John was early enrolled at William and Mary College, from which he was graduated at the age of twenty. He took up the study of law under the noted Chancellor Pendleton, although he seems not to have practiced long as a common barrister. After service in the Revolutionary war, he served several times as a member of the Virginia house of delegates, and filled parts of three unexpired terms in the Senate of the United States. He wrote a number of constitutional pamphlets and books; among them are, An Inquiry into the United States Government (1814); Constructions Construed and Constitutions Vindicated (1820); Tyranny Unmasked (1822); New Views of the Constitution (1823). He was a warm admirer and close friend of Thomas Jefferson, and brought forward and ably defended for him his Virginia Resolutions, in 1798.

As an agriculturist, he is best known, perhaps, by his "Arator: being a series of Agricultural Essays, Practical and Political . . . by a Citizen of Virginia," published at Georgetown, D. C., about 1813. It had previously been published as a series of articles in the Spirit of Seventy-six, in 1809 or 1810. Until the publication of Ruffin's work on calcareous manures, in 1832, there was probably no other agricultural book read with such avidity in the South, as the Arator. Before and after 1818, Taylor was for some time president of the Virginia Agricultural Society, and some of his best ideas were presented in the form of adresses to that organization. Two excellent articles are Artificial Grasses and the Necessities of Agriculture.

Colonel Taylor observed the depletion of soils under the current methods of farming, and was impressed with the necessity for new methods. He was not a scientist, but he presented a natural system of soil-restoration. The principal features of the system were based on vegetable manuring. Briefly, they were these: To protect the soil from grazing during the rest period, and thus raise a large crop of vegetable matter; to make use of vegetable manures of all kinds; to sow clover and grass seed with the grain crop to serve as pasturage or green-manure; to practice horizontal plowing as a preventative of gullies and washes, and to establish artificial meadows and a crop rotation with grass. As a secondary principle, he advocated the throwing up of the soil into narrow beds to facilitate deep plowing, conserve moisture and increase the fertility. The simple and universally adaptable system of horizontal plowing, green-manuring and enclosing, found wide acceptance, and, before the war, horizontal plowing, at least, was the universal method in the upland South, and the bedding system was largely used.

Taylor was a practical agriculturist and his articles published in the Richmond Enquirer, The American Farmer (after 1819) and other papers, took a wide range.

Thomas, John Jacobs.

John Jacobs Thomas, pomologist, was born near Cayuga lake, in central New York, on January 8, 1810. He died at Union Springs, on the same lake, February 22, 1895. He wrote Farm Implements and Machinery, Rural Affairs, and The American Fruit Culturist, which appeared in 1846, and which went through a great many editions. He prepared an incessant stream of inspiring editorials for The Cultivator, and The Country Gentleman. [Biographical sketch in Cyclopedia of American Horticulture, page 1797.]

Thompson, Benjamin. By *Lucien Thompson.*

Benjamin Thompson, farmer, was born in Durham, N. H., April 22, 1806. He died January 30, 1890. He lived eighty-four years in his native town. He was educated in the district school and the academy in the village. He was an orderly sergeant and clerk in the twenty-fifth regiment, second brigade and second division of the New Hampshire militia. On December 8, 1828, he received from his father, Benjamin Thompson, the Warner farm and other tracts of land. He then devoted himself to farming, with success, until his health became so poor that he could not attend to the work. He was a pioneer in raising fruit for the Boston market.

Mr. Thompson was first president of the Durham Agricultural Library Association, organized in 1862, to which he was a liberal giver. In this connection, he is deserving of special attention because of the part he played in the establishment of the College of Agriculture at Durham. On February 12, 1856, he made his will, giving his property to the state of New Hampshire, in trust,—"The object of this devise being to promote the cause of agriculture by establishing . . . . an agricultural school, to be located on my Warner farm, so-called, and situated in said Durham, wherein shall be thoroughly taught, both in the schoolroom and in the field, the theory and practice of that most useful and honorable calling." In subsequent codicils he made favorable concessions to the state. On his death, the state accepted the conditions of his will, removed the College of Agriculture and the Mechanic Arts from Hanover to Durham, and opened the college at Durham to students, on September 7, 1893.

Benjamin Thompson was a man of simple tastes, of a quiet disposition, exceedingly frugal and disposed to save everything from waste. He never sought public office, and refused to accept the same; the only public office that he was known to accept was that of town auditor, in 1846.

Thorburn, Grant.

Grant Thorburn, founder of the seed-house of J. M. Thorburn & Co., New York, and horticultural author, was born in Dalkeith, Scotland, in 1773. He died in New Haven, Conn., January 21, 1863. His establishment was the first regular seed-store in New York and one of the first in the United States. He issued The Gentleman and Gardener's Kalendar, which went to its third edition in 1821. He was a prolific writer for the current press under the *nom de plume* of Laurie Todd. [For portrait and biography, see Cyclopedia of American Horticulture, plate XLI, and p. 1797.]

Thorne, Edwin. By *H. H. Wing.*

Edwin Thorne, horse-breeder, was born January 20, 1826. He died March 25, 1889. He succeeded to the estate of his father, Jonathan (see below), in Millbrook, Dutchess county, N. Y., and on this farm was eminently successful in breeding and rearing trotting-horses, the most notable of which, particularly as a sire, was the stallion Thorndale, with a record of 2:22¼. This stallion was the sire of nine trotters and one pacer with records under 2:30, and was the sire of nine sires who got twenty-six trotters and six pacers, and twenty dams of twenty-six trotters and twelve pacers. Among these were "Edwin Thorne" 2:17½, and "Daisydale" 2:19¾.

Thorne, Jonathan. By *H. H. Wing.*

Jonathan Thorne, stock-breeder, was born April 20, 1801. He died October 9, 1884. He was of Quaker parentage, and his father was a farmer in Washington, Dutchess county, New York. When a young man, he went to New York city, where he engaged, first in the drygoods business, and afterward in the hide and leather trade, and in this he continued for more than fifty years. He was very successful as a business man, and amassed a liberal fortune.

About 1850, Mr. Thorne turned his attention to agricultural pursuits, and on the farm which had formerly been owned by his father and which has since been known as Thorndale, he established a herd of Shorthorn cattle which afterward came to have an international reputation. In this enterprise his son Samuel was also largely interested. In 1852, Mr. Thorne purchased in England three females and one male belonging to the "Duchess family," founded by Thomas Bates, of Kirklevington, and at the same time Mr. L. G. Morris and Mr. N. J. Becar, of New York, purchased another female of the same family, which, with her descendants, afterward came into possession of Mr. Thorne. With this nucleus, Mr. Thorne established his herd of "Duchesses of Thorndale." The herd was bred successfully for several years, and afterward passed into the hands of James O. Sheldon, of Geneva, and then into the hands of Hon. Samuel Campbell, of Utica. Both men maintained the high quality established by Bates and Thorne, and the culmination was reached when, in 1873, the cow, Eighth Duchess of Geneva, was sold at auction by Mr. Campbell for $40,600, the highest price ever paid for a single animal of the bovine race.

Mr. Thorne's contribution to agriculture was not so much in the mere maintenance of the herd referred to, but in the thrifty administration of the large fertile estate which bears his name. Afterward his son Edwin (born January 20, 1826, died March 25, 1889) was equally successful in breeding trotting horses and Jersey cattle on the same farm. The estate is still owned and managed in the same thrifty way by a great grandson of the original owner, the father of Jonathan Thorne.

Thurber, George. By *Byron D. Halsted.*

George Thurber, naturalist, explorer, editor, author, was born in Providence, R. I., September 2, 1821. He died in Passaic, N. J., April 2, 1890. He early manifested a special fondness for natural history. After taking a partial course in a private school, he became interested in pharmacy and engaged in the drug business. His mastery of the subject was rewarded with a lectureship on Chemistry at the Franklin Society of his native city. He found his greatest delight in botany, and he shortly was associated with Doctors Torrey, Gray and others. His desire for exploration was realized in 1850 by an appointment as botanist on the United States and Mexican Boundary Survey, and, for four years, he was actively engaged along the American border from the Gulf of Mexico to the Pacific Ocean. Many of the more important of Thurber's discoveries in botany formed the basis of the historic contribution by Dr. Gray, namely, *Plantæ Novae Thurbereanae*, published in 1854. The genus Thurberia comprises a group of grasses dedicated to Mr. Thurber by Bentham in recognition of his breadth of botanical learning and special familiarity with the grass family.

On his return to Providence, Brown University conferred on Thurber the degree of Master of Arts. Shortly after this, he accepted a position with Dr. Torrey in the United States Assay Office in New York City, which position was relinquished because of a demand made on him for campaign funds. He at once became lecturer in botany in the College of Pharmacy and also in the Cooper Union, while at the same time prosecuting his studies of the Mexican boundary collections, the results of which were published in the Smithsonian Contributions to Knowledge. In 1859, the New York Medical College conferred on him the degree of Doctor of Medicine, and in the same year he accepted the professorship of botany and horticulture in the Michigan Agricultural College, which position he resigned in 1863 to assume the editorship of the American Agriculturist, which latter position he held for twenty-one years. While Dr. Thurber was successful as explorer, professor and scientist, it was as editor that he performed his most effective work for the American people.

Shortly after assuming his editorial labors, and in order to be more effective in his work, he established himself on a few acres in a retired place near Passaic, N. J., where, at "The Pines" with a sister and her family he spent the last years of his life. The careful use of his test grounds furnished the foundation facts for much that he wrote. His Notes from the Pines are conspicuous in horticultural literature for their extent and botanical information. In a second series of papers, Doctor's Talks, extending uninterruptedly over many years, was displayed his rare faculty of clear explanations for the youthful readers in which solid science was clothed in the garb of charming diction. Dr. Thurber rewrote Darlington's Agricultural Botany, under the new title of American Weeds and Useful Plants, contributed all the botanical papers to Appleton's Cyclopedia, a hundred pages on grasses to the Botany of California, and a vast amount of scientific work in connection with editing and oversight of hundreds of rural books on a wide range of subjects published by the Orange Judd Company, with which firm he was long associated. He was a life member of the American Pomological Society, presiding at the Atlanta meeting, long-time president of the Torrey Botanical Club and member of various academies of science.

Dr. Thurber was ever genial and generous, great in knowledge, patient in work, keen of perception, kind-hearted, frank and true, sound in judgment with a most retentive memory.

Todd, Sereno Edwards.

Sereno Edwards Todd, agricultural author and journalist, was born June 3, 1820, at Lansingville, N. Y. He died December 26, 1898, at Orange, N. J. He was the son of Lucretia and Josiah Todd. He was reared on his father's farm and had little schooling. He was a studious reader, especially of the Bible, and educated himself. He studied for a year at Groton and Cayuga academies. After his marriage, June 19, 1844, to Rhoda Peck, of Greenwich, Conn., he settled on a farm. After the death of this wife, he was married again, on March 19, 1887, to Dora Amanda Peterson. In 1862, he removed to Auburn, N. Y. In 1865, he became an associate editor of the American Agriculturist. In In 1866, he became editor of the "Agricultural and Live-Stock Department" of the New York Times, and of the "Home Department" of the New York Observer. He was associated with the Hearth and Home, the New York Herald and other papers, and edited the Practical Farmer. In 1881, he had to give up journalism, owing to failing health. Soon after he moved to Orange., N. J., to a small farm.

He was a voluminous writer on agricultural subjects, and, aside from his contributions to the press, found time to write the following books: The Young Farmer's Manual, Vol. I in 1860, Vol. II in 1866; Wheat Culturist, in 1869; Todd's Apple Culturist; and Todd's Country Homes and How to Save Money.

Townshend, Norton S. (Fig. 160.)
By *Alexis Cope.*

Norton S. Townshend, physician, legislator, professor of agriculture, was born at Clay Coaton, North Hamptonshire, England, December 25, 1815. He died July 13, 1895. He came with his parents to Ohio in 1830, where the family settled on a farm at Avon, in Lorain county. In 1836, he taught a district school. In 1837, he began the study of medicine with Dr. R. L. Howard, of Elyria, Ohio, and at the same time studied Latin, Greek and French with other teachers. In 1839, he attended the College of Physicians and Surgeons of New York, and was a voluntary assistant in the chemical laboratory of Professor John Torrey. In March, 1840, he received the degree of Medical Doctor from the University of New York, of which the College of Physicians and Surgeons was a department.

Fig. 160. Norton S. Townshend.

Shortly after his graduation, he went to Europe to visit the hospitals there. The Anti-Slavery Society, of Ohio, made him its delegate to the World's Anti-Slavery Convention, which met in London in June, 1840. In 1841, he returned to Ohio and began the practice of medicine, first in Avon and afterward in Elyria. In 1848, he was elected a representative in the General Assembly of Ohio for Lorain county. In 1850, he was elected a member of the Ohio Constitutional Convention, which framed the present Constitution of that state, and in the fall of that year was elected a member of the Thirty-second Congress, serving only one term. In 1853, he was elected a senator in the Ohio legislature, instituted and carried through measures providing for the establishment of the institution for the care and training of imbeciles, later known as the "Ohio Institution for the Education of Feeble Minded Youth." He was subsequently appointed a trustee of that institution, which position he held for twenty-one years.

In 1854, being deeply impressed with the importance of providing some scientific training for young farmers, he united with Professors Fairchild and Dascomb, of Oberlin College, and Dr. John S. Newberry, of Cleveland, Ohio, in an attempt to establish an agricultural college. Winter-courses of lectures were given for three successive winters, two winters at Oberlin and one winter at Cleveland. The attempt was a failure financially, and was finally abandoned. In 1858, he was appointed a member of the State Board of Agriculture, and held this position for six successive years. He served in this capacity again during the years 1868 and 1869.

Early in 1863, Dr. Townshend entered the Union army, and was appointed medical inspector of the United States volunteers with the rank of lieutenant-colonel, and continued in the discharge of the duties of that position until the close of the War of the Rebellion. About this time he was associated with Professor Joseph Henry, of the Smithsonian Institution, and Dr. John Torrey, of New York, in making the periodical inspection and examination of the coinage of the United States Mint at Philadelphia.

Doctor Townshend took an active interest in the passage of the act of Congress of July 2, 1862, providing for the national endowment of colleges to teach the branches of learning related to agriculture and the mechanic arts, and an active and influential part in securing the acceptance of the provisions of the act by the legislature of Ohio. In 1869, he was elected professor of agriculture in the Iowa Agricultural College. In 1873, being then a member of the board of trustees of the Ohio Agricultural and Mechanical College he was requested by his associates on the board to resign and accept the position of professor of agriculture in that institution. This he did, and was duly elected to such professorship. He served in this position until January 1892, when he retired as the active head of the department and was elected professor emeritus of agriculture. After his retirement, Dr. Townshend, notwithstanding his advanced age, continued his lectures on agriculture to classes of devoted students, and literally died in the harness.

Trigg, Joseph S. By *Henry Wallace.*

Joseph S. Trigg, farmer, editor, was born in Herfordshire, England, April 8, 1841. He died in Iowa, June 6, 1906. His father had charge of a large farm. Mr. Trigg's early education was very limited. He was sent to a boys' school at the age of seven, and there learned to "fag" for an older boy, a custom of the English schools in those days. When he was twelve, the family came to America and settled on a farm near Fond du lac, Wisconsin. In 1859, they moved to a farm in

Freeborn county, Minnesota, then on the very frontier. Three years later, Mr. Trigg enlisted in the Tenth Minnesota Infantry and served until the close of the war. He returned to Fond du lac, married Laura Spafford, and settled on a farm in Freeborn county. In 1870, Mr. Trigg settled on a farm near Charles City, Iowa. A year afterward, he became deputy auditor of Floyd county, and then auditor, holding that office for eight years. After this, he was engaged in the creamery business for some time.

For some years Mr. Trigg had shown a strong leaning toward journalism, and in 1887, he consolidated three local newspapers under the name of the Rockford (Iowa) Register. This paper gradually came to pay a great deal of attention to farm questions, and to wield a powerful influence on country life. Iowa was then developing her system of farmers' institutes, and Mr. Trigg became an efficient institute worker, especially on dairy and horticultural subjects. A few years later, he entered enthusiastically into the corn-improvement propaganda and became one of the best expounders of the underlying principles of corn-breeding and selection. In 1904, he was invited to become editor of the Weekly Register, or the weekly edition of the Iowa State Register. This weekly edition was established by Mr. C. F. Clarkson. Mr. Trigg threw his whole soul into the work of agricultural education by means of the printed page, institute lectures and addresses at Chautauquas. He overworked, broke down under the tremendous strain, and died.

Mr. Trigg aided greatly in developing the varieties of fruits and grains that would endure the winters of the open prairies of northern Iowa and southern Minnesota. He was a potent factor in developing the dairy interests in his own sections and in the Central West. He lent his aid to developing the system of road improvement by the use of the split-log drag, being one of the best exponents and demonstrators of that system. He was one of the speakers on the first dirt-road's train that was run.

Trimble, Allen.

Allen Trimble, governor of Ohio, was born November 24, 1786. He died in Hillsboro, Ohio, February 3, 1870. His father, Captain James Trimble, moved to Kentucky when Allen was eleven months old. In 1802, his father decided to move to Ohio, and, with Allen, he went to Ohio and chose lands in the Scioto and Point Creek valleys, and 1,200 acres on Clear Creek, Highland county. Here his father set out an orchard, built a home and was preparing to move his family, when he died, leaving the responsibility on Allen. From 1808 to 1816, Allen Trimble was clerk of the court of Highland county. He served in the war of 1812 with distinction, and became colonel of his regiment. He was state representative in 1816, and senator 1817–1825. In 1819 he was speaker, and, by virtue of that position, was acting-governor from January 3, 1822 to January, 1823. In 1822 he ran for governor, but was defeated by Jeremiah Morrow. In 1826, and again in 1828 he was elected governor of Ohio. From 1824 to 1826 he was state canal commissioner. In 1826, he was authorized by the legislature to select the half million acres of land granted by Congress to the state of Ohio for canal purposes. He was one of the incorporators of Hillsboro Academy, which was chartered February 9, 1829, and was president of its board of trustees until 1854. From 1842 to 1850, he was president of the Board of Trustees of the Ohio Wesleyan University. He was a member of the State Board of Agriculture from 1846 to 1851, and was president of the board. He was much interested in the advance of the agriculture of his state, especially the production of hemp and flax, and prepared a careful and valuable treatise on the growth and manufacture of hemp, which he transmitted to the legislature with his message of December 9, 1829.

Trueman, Howard. By *J. M. Trueman.*

Howard Trueman, farmer, writer, was born March 1, 1837. He died March 22, 1908. He spent his life on the farm that had been in the family since 1775, at Pointe de Bute Westmoreland county, Province of New Brunswick. While the occupation of Mr. Trueman was that of a farmer, he was also a writer and publicist on local history and matters connected with rural life. For thirty years or more he was a conspicuous figure at farmers' gatherings, their institutes and associations, always taking a leading part. In 1871, he read a paper before a gathering of New Brunswick farmers in which he dealt with the problems of agricultural education in a way that is only beginning to be appreciated after the lapse of nearly forty years. He urged at that time the need of agricultural education in order that the calling of farming might be more appreciated, and might appeal more strongly to the ambitions of the younger men. To inculcate the development of the intellectual side of farm life was a fixed article in his creed. He published two works of permanent value, The Chignecto Isthmus and Its First Settlers, and the History of Early Agriculture in the Maritime Provinces.

Tryon, Hosmer Graham. By *C. E. Thorne.*

Hosmer Graham Tryon, legislator, agriculturist, was born near Vernon Center, N. Y., October 27, 1825. He died near Willoughby, Lake county, Ohio, April 29, 1889. In 1847, he removed to Lake county, Ohio, and in 1850 was married, at his former home in New York, to Irene Dexter, who died in September, 1888.

Mr. Tryon served three terms in the Ohio legislature, and was a member of the Ohio State Board of Agriculture and of the Ohio State Horticultural Society, of which he was president at the time of his death. He was especially interested in fruit-culture, and gave largely of his strength and time to the encouragement of horticultural and agricultural interests, through work at fairs and conventions. He was one of the small group of men, drawn together from all quarters of the state by community of interest, who have contributed in a marked degree to the upbuilding of the agriculture of Ohio. Of the most pleasing address, but quiet and unostentatious in manner, his work was like the sunshine, which brightens and strengthens everything with which it comes in contact.

Tucker, Luther. By *Gilbert M. Tucker.*

Luther Tucker, journalist, was born at Brandon, Vt., May 7, 1802. He died January 26, 1873. He occupies an important place in the history of American journalism by virtue of his having established, at Rochester, N. Y., October 27, 1826, the first daily paper published west of New York city, a paper still in existence, the Union and Advertiser. He was also the pioneer in agricultural journalism, having also established at Rochester, January 1, 1831, the first agricultural periodical written directly from the standpoint of practical experience, a weekly, originally known as the Genesee Farmer, now the Country Gentleman. It is now (1908) published by a son and a grandson of the founder. The place of publication was changed in January, 1840, from Rochester to Albany. Mr. Tucker at this time became much interested in the operation of the New York State Agricultural Society. This institution he found at a very low ebb. He immediately set about reorganizing it and succeeded in starting, the very next year, the long series of annual fairs which have been regularly held ever since, without a single break. He served the society without compensation or even reimbursement for his expenses, which were considerable, for eleven years.

Mr Tucker was the descendant of a long line of landowners. The first of the name of whom anything is known was granted arms, and it is believed, estates, by William the Conqueror, and his descendants in the direct line were, without exception, both in England and in America, country gentlemen and cultivators of the soil.

Turner, Jonathan B. See page 408.

Valentine, Lawson. By *Byron D. Halsted.*

Lawson Valentine, agriculturist, was born in 1827. He died at Houghton Farm, Orange county, N. Y., May 5, 1891. He was reared in New York city. He was known in business circles in connection with the highest grades of varnish, and their introduction into many markets. He became largely interested in publishing, and was associated with Houghton, Mifflin & Co., The Christian Union, Land and Home, American Agriculturist, Rural New Yorker and American Garden, thus exercising his strong taste for literature and rural life. He believed that agriculture should keep pace with the other industries, and it was his ambition to do something for its progress. His study of the work of Liebig, Boussingault, Lawes, Gilbert and the German experiment stations, led him to found an "American Rothamsted," on 500 acres of land near Mountainville, Orange county, N. Y., which he called "Houghton Farm." There were then but few experiment stations in the country, and the fact that Mr. Valentine had begun a work comparable to that of Lawes and Gilbert in England was remarkable. He treated the farm with his characteristic generosity, and soon after it became fairly organized and equipped he proceeded to make it a permanent institution, trustees were selected, articles of incorporation filed, the deed drawn and the securities set apart for the endowment, "dedicated to the progress of agriculture in America," and embraced property estimated at $100,000, and well-invested funds ensuring a liberal annual income. An unexpected reverse of fortune came, disasters followed, and Mr. Valentine deferred his projects, devoting himself to business to regain his fortunes. In the meantime, the experimental work was suspended, and "Houghton Farm" kept as a summer home. His interest in agriculture remained, and shortly before his death he gave orders to buy again a complement of registered live-stock. The strain of the last few years was too much for his weak body and he died in his sixty-fourth year.

Vaughan, Benjamin. By *S. L. Boardman.*

Benjamin Vaughan, LL.D., writer, member of Parliament, physician, farmer, was born of English parents in Jamaica, West Indies, December 8, 1751. He died in Hallowell, Maine, December 8, 1835. He was the son of Samuel Vaughan, of London, a West India merchant and planter. He was educated under the care of Dr. Priestley and at Cambridge University. When twenty-eight years of age, he commenced writing on political subjects. In 1781, he took a medical degree at Edinburgh. In 1782, he participated in the negotiations for peace between England and the United States. From 1783 to 1794, he lived in London, spending his time between active business and political and scientific studies. He edited the first edition of Benjamin Franklin's writings in London, and through his influence Franklin was induced to publish his memoirs. Many of Vaughan's political writings of this date were published in London and were translated into French and German. He was a member of the British Parliament in 1792–1794. He then went to France, to Switzerland, and finally to the United States, reaching Hallowell, Maine, in 1796, where he settled on an estate inherited from his maternal grandfather, Benjamin Hallowell, a merchant of Boston from whom the town was named. With his brother, who had preceded him, he improved the estate, and engaged in "model" farming on a large scale. They built the largest and most perfect cider mill ever built in New England. The first live-stock imported from England by the Brothers Vaughan were two bulls and two cows, which arrived in Hallowell, in November, 1791, and were selected with great care from the celebrated Smithfield market, being of the Longhorn or Bakewell breed; subsequently, down to 1796, animals were imported of the Holderness or Yorkshire breed. The Vaughans continued to breed from their early importations until after the importation into Maine of the Shorthorn bull, Young Denton, in 1827.

During the period of his life in Hallowell, between 1796 and 1835, Benjamin Vaughan practiced as a free physician among the poor and supplied medicines without charge. In 1807 he received the degree LL.D. from Harvard University, and in 1812 from Bowdoin College. He spent much time in writing literary, scientific and political articles and conducting an extensive correspondence. His correspondents in this country were Washington, Franklin and the elder Adams; in England, Sir John Sinclair, Arthur Young and Sir Humphrey Davy; and in France, Lafayette and Michaux, the eminent naturalist. He prepared, at the request of President Adams, two historical papers, one on the Northeastern Boundary, and one giving the writer's views of the manner in which Turgot's memoirs came into possession of Lord Shelburne several years before their publication. In 1804, he published An Epitome of Mr. Forsyth's Treatise on the Culture and Management of Fruit Trees, By an American Farmer (Philadelphia). He also published The Rural Socrates: or the Account of a Celebrated Philosophical Farmer. He was one of the most distinguished members of the Massachusetts Society for Promoting Agriculture, and published many articles in its series of Papers. Among these are the following: On the Benefit of Stripping the Bark from the Trunks of Trees (1803, pp. 5–23); Means for Increasing the Strength of Timber (1803, pp. 23–43); Particulars Respecting the History and Use of the Species of Gypsum called Plaster of Paris (1804, pp. 9–24); Fruit Trees—A Letter to Judge Knight Foster respecting the Forming of Dwarf Fruit Trees (1804, pp. 47–103). In none of these articles does Mr. Vaughan's name appear as the author, for he always published anonymously or over such signatures as: A Kennebec Farmer; A Member of the Kennebec Agricultural Society; A Calm Observer. Through the influence of the Vaughans the Kennebec Agricultural Society was established in 1787, five years previous to the incorporation of the Massachusetts Society for Promoting Agriculture.

The agriculture of Maine has had no other such educated, practical, scientific and wise a promoter of its interests in all its branches as Benjamin Vaughan. The influence of his teachings and the value of his experiments in fruit-culture and in the improvement of breeds of cattle are noticeable at the present day.

Vaux, Calvert.

Calvert Vaux, American landscape-gardener, was born in London, in 1824. He met death by drowning in 1895. Together with Frederick Law Olmsted he planned Central Park, New York City. He was a business associate of A. J. Downing. At the time of Downing's death, they were laying out the grounds about the capitol and the Smithsonian Institution. [See biography in Cyclopedia of American Horticulture, page 1904.]

Vick, James.

James Vick, seedsman and editor, was born at Portsmouth, England, November 23, 1818. He died at Rochester, N. Y., May 16, 1882. In 1850, he became editor of the Genesee Farmer, then published at Rochester, by Luther Tucker. In 1853, he purchased Downing's magazine, The Horticulturist. In 1860, he entered the seed business. In 1878, he founded Vick's Magazine, which is still published. [See biographical sketch and portrait Cyclopedia of American Horticulture, page 1928 and plate XLI.]

Wales, Arvine C.

Arvine C. Wales, farmer, lawyer, legislator, was born in Stark county, Ohio. He died July 26, 1882, at the age of fifty-three. He was a graduate of the Woodward School in Cincinnati, and of the law department of Harvard University. He was of New England stock. His ancestors settled in the state of Connecticut, more than two hundred years ago, and his father was a pioneer settler of Massillon. One of the monuments to this family is a school, where, for many years, about thirty destitute children have been clothed, fed, and educated by a charity inaugurated by the father and continued by the son.

Mr. Wales was elected to the Ohio state senate in 1870, to fill the unexpired term of General Potts, who had been appointed governor of Montana territory. He was re-elected to the Senate of the sixtieth General Assembly, and was prominent in educational, agricultural and railroad legislation. He was a clear, brilliant and forcible speaker. He had a fund of information and anecdote that seemed inexhaustible. In 1879, he became a member of the Ohio State Board of Agriculture, in which service he continued until his death. He did excellent service in promoting the work of the Board, in assisting to organize the crop reports, and in establishing Farmers' Institutes.

Mr. Wales' delight was in his home and farm. He kept in the front ranks of progressive and successful farming. His methods of feeding and managing his two or three thousand sheep and other live-stock, in connection with wheat-raising, attracted the attention of agriculturists from all parts of the country. He found time, occasionally, to contribute to agricultural and scientific journals. His home was most inviting and hospitable. His library of law and miscellaneous books was very large, and he was master, to a great degree, of what it contained. He was positive in his friendships, and he had strong attachments both to persons and to things. [Adapted from Report of Ohio State Board of Agriculture.]

Walsh, Benjamin Dann. By *L. O. Howard.*

Benjamin Dann Walsh, farmer, writer, the first State Entomologist of Illinois, was born in Frome, Worcestershire, Eng., September 21, 1808. He died November 18, 1869. He was educated at Cambridge University, his tendency at the time being almost purely literary. He was a contemporary of Charles Darwin and was probably personally acquainted with him at college. Many years later, he was one of the first and strongest supporters of the ideas advanced in Darwin's Origin of Species. While in

England, he wrote extensively for periodicals, and published a strong pamphlet on university reform, almost all of the suggestions in which he lived to see carried out. As a classical scholar, he possessed high attainments, and in 1837 he published Walsh's Comedies of Aristophanes.

In 1838, he came to America. He married before leaving home, and on reaching the United States went at once to Henry county, Illinois, and purchased a farm of 300 acres near Cambridge, the county seat. He remained on the farm for more than thirteen years, leading a secluded life and associating little with his neighbors. About 1850, his health became impaired, and he moved to Rock Island, Ill., entering into the lumber business, in which occupation he was eminently successful, and retired at the end of seven years with something of a competency.

Walsh's entomological career lasted only twelve years, from 1858 to 1870, but in this short period he made for himself a name which will live forever in the annals of American science. On economic entomology alone he published 850 notes and papers, and many others on the systematic aspects of the science. He became a regular contributor to the Prairie Farmer, and in 1865 became the editor of the Practical Entomologist, the first journal devoted to economic entomology ever published. Writing and lecturing in his own state, he awoke the people to a sense of the importance of economic entomology, and the state legislature in the winter of 1866–67 passed a bill authorizing the appointment of a State Entomologist. The governor immediately appointed Mr. Walsh to this position, but for some reason the senate did not act on the nomination, and his first and only report was published as acting State Entomologist at the expense of the State Horticultural Society. In 1868, with Professor Riley, he started the American Entomologist, which together they made a most important and very entertaining periodical. The popular ideas concerning insects were mainly erroneous. Quack remedies abounded, and into the fight for truth and enlightment Walsh sprang with a will. The caustic manner with which he showed up the pretentious utterances of quacks had a great effect upon intelligent farming classes of the country.

On November 12, 1869, he was run over by a train at Rock Island, and lost his left foot. The shock of the operation for amputation, together with internal injuries, caused his death.

Warder, John Aston.

John Aston Warder, physician, author, horticulturist and forester, was born at Philadelphia, January 19, 1812. He died July 14, 1883. He was one of the founders of the Cincinnati Horticultural Society and the Wine-Growers' Association, was president of the Ohio Horticultural Society, vice-president of the American Pomological Society. In 1850, he began the publication of the Western Horticultural Review. Hedges and Evergreens appeared in 1858, American Pomology—Apples, in 1867. A report on Forests and Forestry was a result of his visit to the World's Fair at Vienna in 1873, as United States Commissioner. He was instrumental in the formation of the American Forestry Society. He was honorary president of the Ohio State Forestry Society. [See biography and portrait in Cyclopedia of American Horticulture, page 1962, and plate XLI.]

Warfield, William. By *H. H. Wing.*

William Warfield, animal-breeder, writer, was born May 30, 1827, at Grassmere, Fayette county, Ky. He died January 21, 1907, having lived his entire life on the same farm or very near to it. His father was a farmer and breeder of some eminence, and the young man at an early age showed a great interest in cattle. At the age of fourteen he assumed the care of his father's herd, which had been founded in 1826, and which was maintained in continuous existence almost up to the time of Mr. Warfield's death. During his whole life he was a conservative, studious breeder, and his herd may be characterized as having always been composed of animals of uniform good quality rather than having produced a few famous individuals. Although he became a breeder at a very early age, he was not without the means of a liberal education, and was graduated from the Transylvania University in Lexington in 1846. His greatest contribution to posterity was his History of Imported Short Horn Cows, which was published by the American Shorthorn Breeders' Association, and his Theory and Practice of Cattle Breeding, which was published in 1886, and which at once took a leading place among the works of its class.

Watts, Frederick.

Frederick Watts, United States Commissioner of Agriculture, was born in Carlisle, Pennsylvania, May 9, 1801. In 1819, he was graduated from Dickinson College. In 1821, he entered the office of Andrew Carothers to read law, and in 1824 was admitted to the bar. In 1845 he became president of the Cumberland Valley railroad. On March 9, 1849, he was commissioned resident judge of the ninth judicial district of Pennsylvania, continuing until 1852. He continued his private practice at Carlisle, Pa. In 1871 he was appointed Commissioner of Agriculture for the United States, and served until 1877, when he retired to Carlisle.

Welch, Adonijah Strong. (Fig. 161.)
By *L. H. Pammel.*

Dr. A. S. Welch, educator, senator, was born in East Hampton, Conn., in 1831. He died in Pasadena, Cal., March 14, 1889. He went to Michigan in 1839. His preparatory education in the academy of Romeo admitted him to the University of Michigan in 1843, from which institution he was graduated in 1846. During a part of his college course he had charge of the preparatory department. After graduation, he studied law.

In 1847, Dr. Welch became principal of the union school in Janesville, which was the first to be established in Michigan. His success as a disciplinarian and teacher brought to him the principalship of the State Normal School in Ypsilanti, Michigan, of which school he was at the head from 1851 to 1865. During this time he became president of the State Teachers' Association. In 1865, he moved to Florida for his health. In 1867, he was elected to the United States Senate from Florida. The following year he was elected president of the newly organized Agricultural College of Iowa, opening the institution in 1869.

Fig. 161. Dr. Adonijah Strong Welch.

Dr. Welch had the power of addressing large bodies of men in strong, effective English. He was frequently called on to address farmers' gatherings, horticultural meetings, and breeders' conventions. He took a real interest in animal-breeding and made strong addresses on this subject before breeders' meetings. He was interested in the movement to establish agricultural experiment stations, and, with other members of the faculty of the Iowa Agricultural College, attended a convention in Washington in 1885 for this purpose.

Weltz, Leo. By *C. E. Thorne.*

Leo Weltz, landscape-gardener, was born in Prussia, January 27, 1825. He died at his home in Wilmington, Clinton county, Ohio, December 31, 1891. His father was a botanist and geologist, and was employed by the government. Mr. Weltz was a student at the colleges of Osterwick and Magdeburg, and subsequently attended lectures on botany at the University of Heidelberg. He made the study of landscape-gardening a specialty, and graduated from the government botanical garden at Berlin. He was employed for several years as head gardener to Alexander III, Czar of Russia, but was recalled to Prussia to serve in the army. He fought during the revolution of 1847, receiving four medals for meritorious conduct in the field.

In 1851, Mr. Weltz came to America, locating at Huntington, W. Va. In 1852, he went to Cincinnati, where he was employed in the nursery business and in landscape-gardening. In 1853, he was married to Miss Swalenberger, a native of Bavaria, who survived him but a few months. In 1857, he removed to Wilmington, Ohio, which became his permanent home, and where he established a nursery in 1860. He took an active interest in agricultural and horticultural affairs in southern Ohio at an early date. In 1875, he was elected a member of the State Board of Agriculture, in which position he served almost continuously until his death. He became identified with the State Horticultural Society and was for many years a member of its ad interim committee. Mr. Weltz was one of the most active and influential members of these two great agricultural organizations of the state, and seldom missed attendance at their meetings. He was not only recognized as an expert in the lines of industry covered by these associations, but was highly esteemed for his attractive personal qualities. His work must be regarded as one of the potent factors in the promotion and upbuilding of the agriculture of Ohio, using the term in its widest significance.

In 1883, he was appointed by the governor of the state as a member of the Board of Public Works. In 1885, he was commissioned by President Cleveland to investigate the hardy trees and shrubs of Russia, with a view to the introduction of such useful varieties as would be adapted to our climate, an investigation in which he spent several months, and by which he was enabled to add materially to our knowledge of Russian fruits.

White, William Nathaniel. (Fig. 162.)
By *Annie White Mell.*

William Nathaniel White, teacher, horticulturist, editor, was born in Stamford, Conn., November 28, 1819. He died July 14, 1867. He was the son of Anson and Anna (Fitch) White. His parents removed to Walton, N. Y., in 1827, and he received his early education in the schools of that village. He graduated with honors at Hamilton College, New York, in 1847. He was all his life a student of botany and natural history, and learned French and German so as to read the newest and best publications in these languages on his favorite sciences. He inherited a delicate constitution, and after his graduation went to Georgia, hoping to improve his health, and settled in Atlanta in the fall of 1847 as a school teacher. In a few months he moved to Athens, Ga. On August 28, 1848, he married Rebecca Benedict, of Walton, N. Y., daughter of Caleb and Deborah (North) Benedict.

From his earliest boyhood, Mr. White was fond of horticulture, and cultivated his own place in Georgia, with enthusiasm and success. From the first year of his residence in Georgia, he recorded the results of his experiments and investigations with a view of publishing a work on southern gardening, which was so much needed. In 1852, he began contributing articles to the Horticulturist, edited by A. J. Downing. In 1853, he became a regular contributor to the Southern Cultivator. Before the Department of Agriculture was established in Washington, the Patent Office published agricultural and horticultural data and distributed seeds, plants, and the like. For several years before the war, Mr. White wrote by request interesting articles for the Annual Reports. He also wrote frequently for agricultural papers, both North and South. In the spring of 1856, Gardening for the South was published. A second edition, revised by James Camak, was issued in 1867, and a third edition, revised by P. H. Mell, came out in 1901. This book is said to have worked wonders in improving southern horticulture.

Fig. 162. William Nathaniel White.

Mr. White was the moving spirit in organizing the Georgia State Pomological Society, which met first in Athens, August 6, 1856. He was made Secretary and drew up the constitution and by-laws and reported all the published proceedings. In May, 1859, he became horticultural editor for the southern Field and Fireside, published in Augusta, Ga. In 1861, he was made editor and owner of the Southern Cultivator, an agricultural monthly, founded in 1843 and which still exists. It attained its zenith of success under him. By his faithful, skilful and self-sacrificing management, this magazine was published regularly during the war. Although he served in the Confederate army in the campaign of 1863–64, he kept up his editor's work, and when he returned with broken health he threw all his energies into the task of sustaining and upbuilding this monthly. After the war, he made it the leading agricultural periodical in the South, with the largest circulation. Mr. White advocated the founding of state agricultural colleges and state agricultural departments before the eyes of the public were opened to the value of these institutions. He was the foremost authority in the South on matters pertaining to horticulture. Plants and seeds were sent him from all over the world, and his home was a veritable experiment station. He was the first person in the South to begin the practice of protecting fruit-orchards from frost by the smoke from slow fires. Tea plant shrubs were growing luxuriantly in his garden before the war, and he experimented annually in the culture and cure of the tea leaves. He tested all the new varieties of fruits, flowers and vegetables and published his investigations for the public benefit.

Whitney, Eli. (Fig. 163).

Eli Whitney, inventor, was born in Westborough, Mass., December 8, 1765. He died in New Haven, Conn., January 8, 1825. He was born of poor parents and had to make his own way. From a youth he was a mechanic. He earned his way through Yale College, where he was graduated in the class of 1792. After graduation, he was engaged at Mulberry Grove, Ga., to work for Mrs. (General) Nathaniel Greene. While here, his attention was drawn to the difficulty in cleaning cotton. The cotton industry was in a failing condition, owing partly to the fact that by hand only about a pound a day of green seed-cotton could be cleaned. Whitney devoted his close attention to solving the difficulty, making his own tools to work with. In 1793, he exhibited his cotton-gin, as he called it, and its efficiency was at once recognized. The gin is used today, essentially as it was devised by Whitney. The main improvements in it have been in the way of preventing the seed from cutting the staple, and enabling it to pick the cotton from the seed more completely. The machine was able to do nearly two hundred times as much work as could be accomplished by hand. Before the machine was patented, it was stolen, and was manufactured and in use before he could build another model and secure his patent. A partnership was formed between Whitney and Phineas Miller, for the manufacture of the machines in Connecticut. Whitney was granted by the South Carolina legislature $50,000, and was paid a royalty by North Carolina. But much of his income was lost in fighting his opponents who were manufacturing the cotton-gin, and Whitney was unable to make a living out

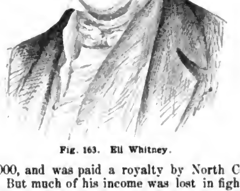


Fig. 163. Eli Whitney.

of it. He established a factory for the manufacture of fire-arms in 1798, in what is now the village of Whitneyville, Conn. In this venture he was successful, and received large orders from the United States Government. In 1817, he married Miss Edwards, daughter of Judge Pierpont Edwards.

Wilder, Marshall Pinckney.

Marshall Pinckney Wilder, pomologist, was born September 22, 1798, at Rindge, N. H. He died December 26, 1886, at Roxbury, Mass. His boyhood was spent on the farm. In 1825, he set up in Boston as a West India merchant, and, twelve years later, became a commission merchant. In 1839, he was elected to the state legislature. In 1849, he was sent to the state senate, and became its president in 1850. In 1860, he was in charge of the delegation from Massachusetts to the convention which nominated Bell and Everett. He was active in organizing the state board of agriculture, and the United States Agricultural Society, of which he was president for six years. He was an organizer and for eight years president of the Massachusetts Agricultural Society, and for eight years president of the Massachusetts Horticultural Society. For twenty years he was president of the Norfolk County Agricultural Society, which he had helped to organize. On the organization of the American Pomological Society in 1848, he was made president, and served several terms. He was a writer and speaker on agricultural and horticultural subjects.

Mr. Wilder was interested in other fields than agriculture and was an active business man. He aided in the founding of the Massachusetts Institute of Technology. From 1868 to 1884, he was president of the New England Historic Genealogical Society. For most of his life he was a bank director.

Willard, Xerxes Addison. By *H. H. Wing.*

Xerxes Addison Willard, farmer, organizer and writer, was born in 1820. He died October 26, 1882. He was educated at Hamilton College, from which he was graduated in 1845. He began the study of law, but soon became interested in farming and dairying. He was instrumental in organizing the Little Falls Farmers' Club in March, 1857, and much of the success of that famous organization, and afterward of the Little Falls Dairy Board of Trade, was due to his efforts and influence. He was one of the first to study carefully the principles underlying the production of milk and the manufacture of butter and cheese. He was the author of Practical Dairy Husbandry, published in 1871, and The Practical Butter Book, published in 1875, both of which became and for a considerable period remained authorities on the subject.

Williams, Edmund. By *Byron D. Halsted.*

Edmund Williams, nurseryman, writer, was born in Montclair, N. J., in 1831. After a prolonged and painful illness, he died on July 12, 1894. He spent the sixty-three years of his life on the homestead amid the shifting scenes of a country-side changing into suburbs. He was a well-known nurseryman. Very largely through his efforts, the New Jersey State Horticultural Society was founded in 1875, and to his self-denying zeal as secretary for the first fifteen years of its existence its success was due largely. It was only when incapacitated physically, that he relinquished the active duties of the office and was made president of the society. He was a constant contributor to the horticultural journals of his day, and anything over his signature secured careful attention. He thought deeply and experimented thoroughly, and for these sterling qualities gained the reward of the careful, conscientious man. His love of truth was sometimes expressed in scathing denunciation of shams. An authority on fruits and flowers, he took more delight in being accurate than in making money, in dealing honestly than in gaining notoriety. He was a life-member in the American Pomological Society and one of its vice-presidents. His generosity was consuming, to which may well be added a childlike modesty that made his strong character peculiarly charming and his personality winsome to those who knew and appreciated the gentleness and candor of the unassuming man.

Wing, Lucius Bliss.

Lucius Bliss Wing, farmer, teacher, banker, was born at Wilmington, Vermont, November 15, 1822. He died at Newark, Ohio, February 1, 1902. His parents were Bani and Thirza Flint Wing. In 1837, his parents removed to Charlemont, Mass., and spent there the remnant of their days. Their large family, of whom Lucius was the youngest, were taught at an early age lessons in thrift, frugality and self-reliance.

Mr. Wing's education was received in the district schools of Wilmington, Vermont, and Charlemont, Mass., supplemented by a few months' study at Ashfield, and in 1844 at Williston Seminary, Easthampton, Mass. For a time he taught school in Franklin county, Mass., at Heath and Charlemont. During the summers from 1847 to 1853 he was clerk and manager of the "De Witt Clinton," a steamboat which made weekly trips between Buffalo and Toledo, carrying both freight and passengers. In December, 1853, he located in Newark, Ohio, and began to buy and ship live-stock and flour to eastern cities. Two or three years later, he purchased about 1,500 acres of government land in Piatt county, Illinois. This tract he kept as a stock-farm for forty years. On a part of it now stands the village of Bement. He retained his residence in Newark, Ohio, and in 1860 went into the banking business, with which he continued his connection up to the time of his death.

In 1875, Mr. Wing was elected a member of the Ohio State Board of Agriculture, and held this position for five years, being president of that body in 1880. The origin and success of the Ohio system of farmers' institutes are due in great measure to his support and foresight. In 1881, he was appointed a trustee of the Ohio State University, which position he held for almost twenty-one years; for more than fourteen years he was chairman of its executive committee, a member of the farm committee for the entire period of his trusteeship, and was twice elected to the presidency of the Board of Trustees. He stood strongly for the upbuilding of the branches which form the foundation of agriculture and the mechanical arts, and it was mainly through his efforts that the department of agricultural chemistry was established.

Mr. Wing was married, in 1855, to Mary M. M. Mayhew of Charlemont, Mass. Mrs. Wing survives her husband, as do also a son and a daughter. In his family life and relations Mr. Wing was exceptionally fortunate and happy. [Abstracted from The Old Northwest Genealogical Quarterly.]

Woodman, Jonathan J.

Hon. Jonathan J. Woodman, teacher, legislator, Master of the National Grange, was born in Sutton, Caledonia county, Vt., May 25, 1825. He died July 13, 1907. He went to Antwerp township, Mich., with his parents, at the age of ten years. His early life was spent in teaching school during the winter months and working on his father's farm during the summer, completing his school education at a private academy before he was twenty-one years of age. In 1852, he resigned the position of principal of the Paw Paw union school and left home to spend two years in California. He saved enough out of the venture to enlarge his farm. He was married to Harty H. Hunt on March 30, 1856. As a result of this union one child was born. Mrs. Woodman passed away in 1894. In 1896, Mr. Woodman was again married to Rev. Olivia J. C. Carpenter, who was at that time pastor of the Universalist church at Farmington, Mich., who, with the only child, L. K. Woodman, of Paw Paw, survived him.

In 1860, Mr. Woodman was elected to the legislature, and served for twelve years. During the war he was chairman of the committee on military affairs. He later became Speaker of the House. He made an exhaustive study of the history of parliamentary law. In 1872, he became a charter member of the Paw Paw Grange. When the State Grange met in Grand Rapids, in 1874, Mr. Woodman was elected Master, a position he held for six years. In 1878, President Hayes appointed him one of the United States commissioners to the International Exposition held in Paris. The year following his return he was elected Master of the National Grange. Under his leadership, that body urged on Congress the enlargement of the Department of Agriculture, and insisted that its head be made a cabinet officer. This result was secured in President Cleveland's first administration. During his six years as Master of the National Grange, Mr. Woodman delivered lectures in nearly every part of the United States. He was one of the strongest friends the Michigan College of Agriculture had. [Adapted from The True Northerner, Paw Paw, Mich., July 19, 1907.]

Yeomans, Theron G. By *S. Hoxie.*

Theron G. Yeomans (1815–1901), was a successful nurseryman, orchardist and cattle-breeder. Until fifteen years of age he was accustomed to farm life. Then he became an assistant of his brother, who kept a store at Walworth, N. Y. At twenty-one years he succeeded to the business, which he continued until 1845. At that time he bought land in the village, on which he spent his time in planting and cultivating a nursery of fruit trees. In 1879, he went to Holland and imported thirty-three pure-bred North Holland cattle. He joined the Holstein Association and registered these cattle in its herdbook. The Dutch-Friesian Association was organized the same year, but he took little or no part in the controversy between the two organizations. In 1885, he advocated union and was chosen first president of the new Holstein-Friesian Association. He was a staunch supporter of the advanced registry system. Largely through his efforts were the attacks on this system successfully repelled, so that it became a permanent feature of the Association.

Young, Brigham. By *J. C. Hogenson.*

Brigham Young, Mormon leader and organizer, was born at Whittingham, Windham county, Vt., June 1, 1801. He died August 29, 1877. The family moved to western New York, where as a young man Brigham Young learned the trades of carpenter and painter. He was a man of great genius, with a powerful, well-balanced mind. Practical in thought and method, he was a natural leader of men. Joining the Mormon Church in 1832, he became the recognized leader of that body after the death of Joseph Smith in 1844. It was he who organized and personally conducted, and on whom rested the whole responsibility of planning and providing for the exodus of the Mormon people from Illinois and the journey through the great wilderness to the desert regions of the Great Basin, that region where Colonel Bridger had offered $1,000 for the first bushel of wheat that matured there. The pioneers wended their way through the wilderness of more than a thousand miles, arriving in Salt Lake Valley July 24, 1847. All haste was made to till the earth and plant the seed they had brought with them. After the seed had been planted, a little stream was diverted from its course and its waters spread over the ground (the first practical irrigation for which this region is now noted). The present plan of Salt Lake was laid out by Brigham Young,—size of blocks ten acres, width of streets eight rods, intersection at right angles. When the gold fever came in 1849, Young's counsel to the members of the colony was to remain at home, raise grain and build houses. After the territory had been explored, colonies were sent out to build towns. Care was always taken to have the various trades represented in each colony. Young's plan was to build up the whole surrounding country. Within two years after reaching Utah much of the wild and barren desert was thus redeemed.

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